The Glass Industry

Copyright, 1924, by Glass Industry Publishing Company, Inc., New York

Vol. 5 SEPTEMBER, 1924 No. 9

Some Aspects of Tank Block Corrosion

By S. R. Scholes*

The subject of corrosion of blocks is one that is always in the mind of the manufacturer of tank glass. A new impetus to discussions of this annoying and costly phenomenon has been supplied by a recent article[1] advocating the insulation of tanks. The argument advanced is that by insulating and thereby carrying a deeper body of hot glass, more glass can be kept in motion in a tank, and thus the time for plaining increased so that a lower general temperature can be carried. The opposite view is also well supported that corrosion is best fought by cooling the blocks.

In the writer's opinion the blocks themselves must be made more resistant to the attack of molten glass. It does not seem reasonable to suppose that the glass industry, in which such tremendous strides have been made in the last few years along the line of automatic production, should be so handicapped as to be obliged to use tank blocks no better than those of twenty years ago. The opinion is freely expressed among glass men, that blocks are not even as good as they formerly were. But they no doubt overlook the greatly increased tonnage drawn from the tanks.

The life of blocks is often reckoned by the time they have been in service, as indeed it seems logical to do; but a better measure of their usefulness would be total tonnage drawn per square foot of melting area. This takes into account not only time of service, but also rate of glass movement and temperature maintained. For when high tonnage is melted, high temperatures are necessary if glass of satisfactory clearness is to be produced. Experience shows that blocks corrode much faster at 2,700° than at 2,600°, as we should expect. There are enough instances of blocks remaining at nearly their original thickness in quiet corners of a tank, while other blocks in the same tank where movement of glass is more rapid are practically eaten through, to demonstrate the importance of the other factor of corrosion.

Having then recognized the two chief agents of corrosion in high temperature and glass flow, and having seen that these act together to the great disadvantage of the blocks and their owners, it becomes interesting to look more closely into the mechanism of corrosion. To do this it is well to set down first the constitution and properties of the two materials in contact, glass and clay.

Glass is a mixture of silicates of soda and lime, dissolved in silica, which when heated loses its rigidity at about 900°, becomes ductile at a low red heat, and at 2,600°, about as fluid as corn syrup. Burnt clay is a silicate of alumina, carrying an excess of silica, only small amounts of alkali silicate and traces of iron and lime. When heated it remains rigid to high temperatures, shows a tendency toward sintering at 2,200°, and at the neighborhood of 2,700, becomes soft enough to dent with an iron bar. The final melting temperature is probably above 2,800°.

Thus it is seen that we have two substances in contact, as container and contained, that are much too similar. Given the fact that mere contact with another compound of similar constitution will lower the melting point of any substance, and the additional fact that both alumina and silica are readily soluble in glass and usual constituents of glass, it is clear that a solvent action takes place whenever hot glass comes against hot clay.

Further, the more nearly the temperature approaches the melting point of the blocks, and also the more fluid the glass becomes, the more rapid this solvent action becomes. And it will be of especial interest to study the nature of the resultant solution of clay dissolved in glass. The specific gravity of clay—the substance itself, not the porous blocks—is about 2.70, while that of lime glass is about 2.45. Hence it follows that the solution of clay in glass is more dense than the glass. That the solution is more viscous than the glass, and that it is colored green by the iron in the clay are also facts of interest and have their bearing on some problems of tank operation.

This matter of specific gravity of glass and clay solution furnishes an explanation for some of the observed phenomena of tank-block corrosion. The clay solution sinks in the glass, thus building a layer of heavier glass on bottom blocks, which become practically saturated with clay. Therefore the bottom blocks, and in fact all block surfaces lying horizontally beneath the glass, are protected from rapid corrosion by the presence of a layer of glass rich in dissolved clay. On

* The Federal Glass Company, Columbus, O.

[1] Brownlee—THIS JOURNAL, July, 1924, page 125.

the other hand, side blocks show grooves where the clay solution has flowed down their surfaces. And the rapid corrosion of throat covers is due probably more to their location above the solvent glass than to the movement of glass past them. That is, throat covers are taken away more by corrosion than by erosion.

An illustration of this effect, the acceleration of corrosion on surfaces that are located so that the heavy clay solution can flow away from them freely, as compared with the rate of corrosion on surfaces facing upward, is found in the examination of certain channels used for flowing glass to feeding devices. These channels carry a stream of glass nine inches wide and from four to six inches deep, flowing at the rate of about seven tons in 24 hours. The channel blocks have walls three inches thick and bottoms four inches, and project into the working end about six inches. After ten months' service, when the glass had been tapped out of the tank, these channels showed severe corrosion on the lower side of this projection, also on the outer lower corners, notwithstanding the fact that the movement of glass at these points was negligible. Fully an inch of clay was corroded from the bottom, leaving a mass of honeycombed block with "stalactites" hanging from it; while the channel proper was smooth and practically unworn.

This is a striking demonstration of the influence of the greater specific gravity of the clay solution as compared with clay-free glass, upon tank block corrosion. It is clear that this influence is a determining factor in the rate of clay solution from different surfaces.

The grooves visible on side-walls after long service have been explained by Brownlee as due to the convection currents set up by the sinking of the cooler glass next the walls. But in the writer's opinion, the heavy clay-bearing glass sinking along these surfaces is sufficient to explain this grooving or scoring action. Moreover, if the convection currents were sufficiently powerful to act thus in eroding the walls, they would cause enough circulation of the glass to bring about the deeper and wider movement of the stream through the melting end that is supposed to be achieved by insulation.

The foregoing presentation of the principle of the sinking of dissolved clay in the glass which dissolves it is offered in the hope that it will stimulate further study of this interesting phenomenon, and also emphasize the crying need of the glass industry—better blocks.

Some Glassmakers' Problems and How They Were Solved

By Irving E. Adams*

It has been my privilege to serve many glass manufacturers in recent years in a consulting capacity and the editor of this magazine feels that a discussion of some of the problems encountered might prove of interest to its readers. The instances cited are in the main unrelated, but taken collectively they picture troubles that arise that make it seem advisable to call in a man outside of the local organization.

A plant making a line of green prescription bottles by a feeder and machine process and operating an old type Jensen tank, oil fired, and with only a single set of regenerative chambers, was troubled with seedy glass, production was unsatisfactory, and they were experiencing a steady financial loss. The tank was 14 feet by 22 feet in the melting end and the fuel was applied at points through the side-walls half way between the ports—constituting, in all essentials, a system of direct firing. Though the tank was cold, the checkers were white hot. Since results were wanted quickly, and it would have been expensive and time consuming to install a different firing system, I decided to take a chance on the checkers and apply more fire. Within a relatively short time the tank was heated up, seed disappeared, losses changed to profits, and the tank which had been running six months, lasted three months longer and then went out from a break in the side-wall, and not because the checkers had ceased to function. In this instance the local superintendent had been unduly cautious.

Another example of extreme caution on the part of a local superintendent that nearly wrecked the concern, occurred at a plant making flint bottles. This particular concern had taken over an old plant, but had installed a new tank embodying latest developments in engineering design. For three months very little salable ware was made and of course the new tank was made the goat. A cursory examination showed raw materials to be high grade, batch and cullet proportions in accordance with good practice, and producer operation satisfactory; yet the melting end was obviously cold, glass seedy, and color green. Only one move was required to remedy this entire situation and that consisted in raising the stack-damper six inches. Within a few days the plant was making good glass. The man in charge, acting under instructions from the representative of the construction engineers who had started up the producer plant and tank and specified the damper position, had hesitated to vary much from these standard conditions through fear of ruining the tank.

A plant in West Virginia making a line of thin blown ware from a new continuous tank of modern design and using a prepared selenium decolorizer mix had been troubled with green glass for three months. The fuel used was natural gas and the pull very light. The stack damper was set at 4 inches, the fire was soft and smoky, and about 10 times the amount of decolorizer mix that the directions specified was being used. The local superintendent had tried raising the stack but found it cooled off the working end. There was a rather high shadow wall built on top of the division wall, and by removing some of this in conjunction with raising the stack we soon had a bright, clean fire, decolorizer mix reduced to normal, and color satisfactory.

A firm making a line of flint bottles called me to their plant, without specifying their trouble. I found a tank of

* Consultant on glass problems, Ambler, Pa.

good design, sufficiently hot, and not pulled beyond capacity. Yet the ware showed evidences of devitrification, was very cordy, and the melting end was badly scummed up. Their trouble was a function of batch composition as is apparent from a glance at what they were using, given in the first column below; and we soon had them making good ware by making the changes indicated in the second column:

	I. Pounds	II. Pounds
Sand	1,000	1,000
Soda	400	370
Hydrated lime	90	150
Lepidolite	40	...
Salt Cake	...	5
Arsenic	2	1
Selenium decolorizer	No change	
Cullet	No change	

A manufacturer of polished plate glass called me to his plant. He had been troubled for a long time with what is commonly called "knots," or "strings" or "drops." The percentage of inferior glass or O. B. ranged around thirty-five, and owing to the peculiar nature of this defect it is difficult to cut large sizes. The trouble was general in all furnaces, which were fired by natural gas. The batch seemed to be rather lean, the furnacing conditions rather drastic, the finishing temperatures very high, and the finishing time rather short. The following moves brought about a reduction in percentage of O. B. from thirty-five to nine during the next week:

1. An increase of soda in the batch.
2. A softening of the fire by using less air at all stages of the melt.
3. The use of a lower finishing temperature.
4. An appreciable increase in finishing time.

In this case and in two similiar instances in which the writer was called in the defect had been attributed to the pots. It unquestionably is a pot phenomenon, perhaps a special type of cord, yet it seems to disappear when the pot is treated in a normal manner as regards temperature and batch composition. One precaution should be noted in the application of the above general mode of procedure, namely, a tendency to run into "bubble" if the furnaces are run too much on the cold side.

In several instances my services have been enlisted to remove scum from the melting end of a tank. There is a tendency for scum to accumulate in those glasses where the ratio of lime to soda is 1 to 2 or greater. Scum is essentially a glass very high in silica and low in fluxes and hence infusible at prevailing tank temperatures. It forms less frequently on natural gas than on producer-gas fired tanks. A typical case of the effective removal of a scum at least six inches thick at a Southern plant making flint glass illustrates my customary mode of procedure. Reaching the plant on a Saturday morning, no raw material was filled in during the forenoon and a sharp, clean fire was maintained. From noon until 3 P. M. we dug out as large an area as could be reached from the dog-house while still maintaining a hot fire. Producers were then shut off for burning-out. About 60 pounds of salt cake was thrown in with shovels. The fires were back on and the furnace up to temperature by 6 P. M. The metal line had dropped about four inches during the day. From then until Monday morning the tank was kept hot and their regular batch but with the addition of 10 pounds of salt cake to 1,000 pounds of sand and no cullet, was fed in at regular intervals and in sufficient quantity to re-establish the working level. The same batch was continued Monday but with the addition of cullet. On Tuesday the salt cake was reduced to five pounds and maintained at that figure for the balance of the week. By then the scum had disappeared and we had not lost the color.

A firm in Ohio making a line of thin blown ware was experiencing trouble from fine seed. The tank was hot and the pull not excessive; yet the glass instead of being thin and watery in the dog-house seemed viscous and gummy. They were using 150 pounds of feldspar to 1,000 pounds of sand. By reducing the feldspar to 65 pounds the glass cleared up in a few days. Apparently the very high feldspar content increased the surface tension of the glass at high temperatures and prevented the proper elimination of gases.

A firm making a line of flint prescription ware by a feeder and machine process was troubled with seedy glass. The tank was 14 ft. x 18 ft. in the melting end, oil fired, and melting on 12 square feet. They were using a rather high soda, low lime batch and in order to make this illustration concrete I am going to give in parallel columns, without further comment, the batch they were using and the batch I applied which eliminated their trouble:

	Original Pounds	Suggested Pounds
Sand	1,000	1,000
Soda	400	370
Burnt lime	75	110
Salt cake	6	6
Arsenic	2	2
Decolorizer	9½ ozs.	9½ ozs.
Cullet	1,500	750

To illustrate the variations in batch composition that one finds in different plants making the same product the following discussion may prove of interest. Two plants making in one case lamp chimneys by a semi-automatic process, and in the second case lamp chimneys plus a general line of thin blown ware, and each operating end-port, regenerative, natural gas fired tanks 14 ft. x 16 ft. in the melting end, were each melting a ton of glass to 12 square feet of melting end surface and their product was free from seed and of good color. In the first column below is given the practice in vogue at one of these plants, in the second column the one in use at the other, and in the third column the batch introduced by the writer to replace the one in the first column with the object of decreasing finishing room breakage. At the end of three weeks it was apparently functioning as well as No. 1.

	I. Pounds	II. Pounds	III. Pounds
Sand	2,000	2,000	2,000
Soda	800	750	775
Feldspar	280	...	75
Burnt lime	245	180	200
Nitre	...	40	...
Salt cake	...	...	20
Arsenic	6	5	5
Borax	5	...	...
Cullet	3,000	800	2,000
Decolorizer	...	...	...

A little plant in West Virginia making a line of thin blown ware was having considerable trouble with cord and low color. Very marked improvement as regards both these defects was brought about by using a somewhat higher stack draft, a higher melting end temperature, and making the batch changes indicated in the second column below:

	I. Pounds	II. Pounds
Sand	2,000	2,000
Soda	800	740
Burnt Lime	225	190
Arsenic	6	4
Borax	2	4
Cullet	3,000	1,500

A firm manufacturing a line of green bottles by a feeder and machine process in a tank that was being pulled very hard was troubled with seedy glass. The tank was producer gas fired and the main flue from the producers was very long and tarred up badly toward the end of each week. The checkers were prevailingly cold. The only change made was to raise the stack damper a few inches and meet this increased draft by using higher steam pressure on the producers. The interest attached to this particular case was that in all previous attempts to raise the stack damper with a view to heating up the checkers they had failed to increase the steam pressure.

A rather interesting problem was brought to the writer's attention at the plant of a manufacturer of wire glass. This particular firm had gone on for a good many years with very little glass trouble and suddenly, and without any apparent change in operating conditions developed a serious case of cordy glass. The trouble was eventually traced to the burnt lime used which showed on analysis more than five per cent of the natural calcium metasilicate wollastonite. Shortly after changing the source of supply of the lime, the cord disappeared.

Several times the writer has been called to plants which were making a line of flint ware, and decolorizing with some selenium mixture, in which the color was prevailingly low. Almost always it has been possible to remedy this trouble by using enough stack draft and a clean enough fire to maintain at least neutral, if not faintly oxidizing conditions on the hearth.

During the last two years there has been a growing tendency to use a little salt cake in conjunction with the normal ingredients of flint, green, and amber batches. Its value as an antidote for scum formation has been recognized for many years in the polished plate and window glass industries, though in these fields its lower cost as compared to soda ash, the increased fusibility gained, and its value as a fining agent have been of more importance. The writer has run across several manufacturers of green and amber bottles who have used it for many years, undoubtedly for some of the purposes outlined above. In amber glass, further, it seems to increase the viscosity range and thus lessen the tendency to freeze at the throat in cold weather.

In flint batches salt cake can rarely be introduced in amounts greater than 5 pounds to 1,000 pounds of sand owing to the increased difficulty in maintaining color, at least without modifying the composition of the decolorizer mixes customarily employed. Here its principal function is that of scum preventative. When used for this purpose it is usually possible to eliminate borax entirely and reduce appreciably the quantity of arsenic ordinarily used.

Another development, the scope of which the future can only determine, is the recent tendency to sharply decrease soda and increase lime, either with or without the employment of a little salt cake, in certain lines of flint glass manufacture. The gain in fusibility from the use of the higher lime more than counteracts the loss due to reducing soda, and the higher purity of present-day soda ash aids the movement. From the very nature of the batch changes involved the resulting glass is certain to be stronger mechanically and more chemically durable. At the same time it is apt to set more quickly and consequently check in the blank molds (in machine-made ware) unless the air distribution is modified; and in extreme cases it becomes necessary to change the shape of the blanks.

Further, in those lines of the flint glass trade where a relatively slow setting glass is essential, such as illuminating goods, blown ware, and pressed tumblers, the new batches do not apply for here the lime content must not exceed a certain maximum.

It may be noted that in recording recent advances in current glass practice little stress has been laid on the use of feldspar or other aluminum-containing compounds in flint batches. The writer is fully cognizant of the value of such additions as an aid in increasing durability in the finished product, but is still inclined to believe that such additions are often accompanied by disturbances in the melting end of very appreciable magnitude.

In a letter received some months ago from Dr. R. R. Shively, the arguments favoring the use of such additions were very ably presented, and I am taking the liberty of permitting the editor of this journal to print certain excerpts from the letter elsewhere in this issue.

In conclusion, I would like to point out two practices, both having an adverse influence on both quality and production, which I find very commonly in my travels. In many plants it is still the custom to attempt to run with prevailingly low stack dampers, the object being, of course, to save fuel. If manufacturers, however, would only come to a full realization of the troubles that arise from this practice I am sure that it would soon be given up. The other practice that I have in mind is more often found in those plants where the superintendent has been accustomed in former years to operating on a hand basis. In those early times it was probably entirely permissible, whenever the glass beame seedy, to increase soda with a view to overcoming this trouble. However, in these days of small hot working ends and feeder and machine operation such practices enhance rather than retard the seed trouble. Whether this is due to what is sometimes described as a secondary boil or, as I prefer to believe, due to the gradual decomposition of excess sodium carbonate into sodium oxide, does not matter. The thing of prime importance is that seed troubles can very frequently be helped now by reducing rather than increasing soda.

Dr. Shively on the Use of Alumina in Glass

An interesting presentation of arguments in favor of the use of feldspar or other aluminum-containing compounds in flint glass batches was made recently by Dr. R. R. Shively[1] in a letter to Irving E. Adams, who refers to the communication in his article "Some Glassmakers' Problems and How They Were Solved," in this issue, and through whose courtesy we are enabled to present the following excerpts:

From Dr. Shively's Letter

In regard to the use of alumina in glass, there has been a great deal of work published some of which, in my opinion, is over-exaggerated. There are certain things which experience has proven to me and which various investigators have found to be true, and while this work is unquestionably familiar to you, I want to take the liberty here to cite several references which will help to strengthen my argument.

First, the Bureau of Standards Fellow of the Glass Container Association last year collected a number of different glasses made by various manufacturers, subjected them to different conditions and in a very exhaustive report made at the Glass Container Association meeting at Atlantic City, in April, 1923, very clearly brought out that the best glass from a durability standpoint was that, the analysis of which showed the presence of 1.5 per cent. alumina. Also, you have probably noted the work of W. L. Baillie—"An Examination and Extension of Zulkowski's Theory of the Relation Between the Composition and Durability of Glasses"[2]—which shows that in determining the durability of glasses, the original work done by Zulkowski was correct, but that the alumina present also has an influence similar to that of lime, in that it serves to increase durability.

It might be well to mention here that the Bureau of Standards has carried on a very exhaustive series of experiments and has verified the above work. Also, I want to call your attention to another article published in May, 1921, issue of the above mentioned journal, entitled, "The Effect of Aluminum on the Annealing Temperature of Glass," by S. English and W. E. S. Turner. To summarize this paper, the writers find that in general the addition of alumina reduces the annealing temperature. In another article in the same journal these same writers made a test which undoubtedly furnished proof as to the value of alumina for its power of preventing devitrification.

In regard to the prevention of devitrification by the presence of alumina, I can give you numerous other articles, but I know that you are probably conversant with most of them and do not wish to bore you with further detail.

Another article recently published, of which there have been a great many similar articles, proves conclusively that glass containing alumina remains in a working condition over a longer range of temperatures.

In summarizing, it is my opinion that there is conclusive proof that alumina has the following properties:

1st—It aids in the prevention of devitrification.

2nd—Increases the durability of the glass.

3rd—Lowers the annealing point of the glass and gives a product that is workable over a longer range of temperatures.

4th—Gives a strong glass.

There are other claims made for alumina for which there is no conclusive proof, and they will be admitted here.

Now, as to the source of alumina, I believe the use of either feldspar or lepidolite has its advantages over aluminum hydrate on account of being used in larger quantities, thereby obtaining a more uniform mixture, and one gets the benefit of the fluxing properties of the potash in the feldspar and the lithia and potash in the lepidolite for practically the same cost. Feldspar is cheaper than lepidolite, but as most glass manufacturers are interested in good color and have no chemist to analyze their material, I think that lepidolite is cheaper in the long run. We guarantee the iron content to be below .05, and, as a matter of fact, it really runs around .02. Besides, if the fluxing value of lepidolite is taken into consideration as compared to feldspar, it is possible and advisable to reduce your soda content when using lepidolite, which effects considerable saving. In several instances this was not done, and lepidolite was given credit for being hard on blocks when as a matter of fact lepidolite used wisely is anything but corrosive on blocks or pots.

As to the amount of alumina to use, I am of the opinion that some manufacturers are overdoing the thing, and in the case of the firm you mentioned, their glass contained too much alumina, which increased the surface tension of the glass at high temperatures and prevents the proper elimination of gases. You must bear in mind that there is always present in glass-making materials a small percentage of alumina, and there is dissolved from the block a certain amount of alumina. Certain glasses I have analyzed in which no alumina was added, other than that above referred to, contained as high as .75 per cent Al_2O_3. This glass was from a new tank, and I think is explainable by the increased amount of block dissolved. It is my opinion that this was the trouble at the firm you mention as they were adding enough feldspar to give over 1 per cent alumina in the finished product, and with what they were introducing as impurities, together with that dissolved from the tank, made an alumina content of over 2 per cent, which I consider too high.

I do not advise using more than 1.5 per cent. The fact that they were able to reduce the breakage at the firm mentioned verifies to me the statement that it lowers the annealing point of the glass and increases its strength.

[TECHNICAL EDITOR'S NOTE.—Dr. Shively's contentions about alumina concur with my experience, especially when he states that the alumina business is apt to be overdone. For instance, a certain large modern plant in the South where window glass was being made with over 3 per cent alumina was experiencing serious trouble and I blamed the excess of alumina for most of their difficulties, but was unable to convince them. I think 1½ per cent alumina is about the limit, that is, for window glass. For bottle glass it appears to be possible to use a much larger quantity when the bottles are not blown by machinery. On the whole, there seems to be quite a difference of opinion on this subject and the wisest course has always seemed to be to introduce only small amounts of alumina so as to be on the safe side.—*J. B. Krak.*]

[1] B. F. Drakenfeld & Co., New York.
[2] Jl. Soc. Glass Tech. Vol. 6, No. 21, (May, 1922), p. 68.

The Commercial Decoration of Glass Articles*

The Part Gas Is Taking in Placing an Old Art on a Business Basis

By Elmer B. Dunkak†

Glass making and decorating is a very old art. Its origin is generally credited to the Egyptians, although some authorities go back still further to the days of the Phoenicians. Paintings on the wall of the tomb of Beni-Hassan (2000 B. C.) show Theban glassmakers at work, and recently in other ancient tombs various articles made of glass have been brought to light.

As far as records show, Egypt seems to have been responsible for the introduction of the art to Europe, Rome having started to produce decorated glassware in the year 14 A. D. The Romans, being gifted with a quick intelligence, soon became the leaders of the world, and the industry flourished until the decline of the Empire.

Toward the end of the thirteenth century Venice was producing wonderfully ornate decorated glass and guarding the secret of its manufacture most jealously. Consequently the growth of the industry was slow and it was the seventeenth century before the rest of Europe took up the manufacture. Of course, at this time all operations were hand ones and each piece turned out was very costly. For example, in Germany, where some of the finest enameled glass was produced, the greatest artists of the time engaged themselves in this work, producing some wonderful specimens. From that time until very recently no improvements on the methods of production had been made, and it appeared as though this industry would be forever limited to the individual efforts of artists.

Charles Zeh of Clifton, N. J., realized the commercial possibilities of decorated glass and set about to find a method whereby the hand operation of putting the design on the article would be eliminated and the permanency of the design would be assured. It was eight years before a method was developed that would bring the art within the range of commercial possibilities.

The patented process consists of printing from a lithographic stone to a gummed paper with chemically treated colors. The print is applied to the glass much the same as in china decorating. The paper is removed and the article placed in the gas kiln and fired. The success in the application lies in the proper compounding of the colors so that complete harmonization with the constituents of the glass takes place at the fusing temperature. Decorating work of this sort on china is not new and is comparatively easy, as the design is only fired into the simple surface glazes.

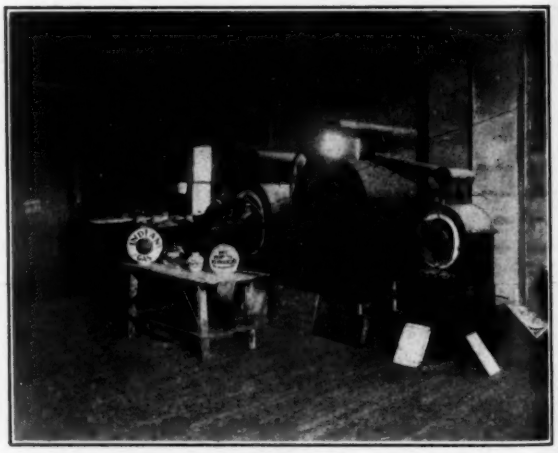
The kilns now used by this concern are gas fired, all being muffled but two. Gas is not the only fuel that has been tried, so its adoption has not been by accident but rather by a process of elimination. Coal, wood, fuel oil, gasoline and electricity have all been used and all have shown their shortcomings to be too great for them to be of any value.

Coal and wood were eliminated because of the dirt and ashes they created as well as the attention that was necessary. Lack of temperature control was another item.

Fuel oil and gasoline were fire hazards and weren't controllable as to any nicety of temperature. Electricity was tried, and it fell short largely because of the cost of operation.

Gas is all that can be desired for this work, giving cleanliness, continuity of service and accurate temperature control. Its satisfaction to the management is best shown by a state-

PRESS ROOM
Gummed paper is printed with chemically treated colors which are then applied to the glass. The paper is removed and the article placed in the kiln and fired.



KILN ROOM
Where glass pieces are treated in gas-fired equipmeent at a temperature range between 900-1200 deg. F., depending on style of work, etc.

* From *Industrial Gas*, New York, August, 1924.
† Public Service Gas Company of New Jersey.

ment made to the author. Mr. Zeh said: "All our fusing is done by gas because we have found it to be the neatest, cleanest and most economical of all fuels we have tried."

Careful firing of the kilns is of great importance, as very delicate work is put through. The temperature range is between 900 and 1200 deg. F., depending on the style of work being done. The temperature carried is just high enough to melt both the glass and the color, and as soon as fusion takes place it is lowered so no warping will set in.

FINISHING DEPARTMENT WHERE DECORATED ARTICLES ARE GIVEN FINAL ATTENTION

The work done by Zeh, Inc., is irremovable in every respect and any design or lithograph can be reproduced in the finest of colors or tints. None of the color value is lost and it appears that a design fused in glassware has an added touch of beauty.

The commercial field has taken the idea with great enthusiasm, work being done for some of the largest nation-wide advertisers in the country. Gasoline globes and discs which formerly had to be repainted every year or more are now processed under the Zeh patents and as a result have a design permanently fused into their body that is just as durable as the glass itself. Glass signs for outdoor and indoor use, glass labels for bottles and containers, glass traps and tumblers, have all been produced.

The plant has recently been doubled in size and already plans are being made for much larger quarters which incidentally call for an 80 foot continuous lehr.

Cutting Air-Port Holes With Sand Blast

There recently arose at the Navy Yard, Charleston, S. C., the problem of supplying deadlight lenses for certain work on one of the vessels undergoing overhauling. There were a number of lenses on hand, but none was of the size required for this special job. Several attempts were made to cut down lenses by scribing them on both sides with a diamond cutter; by breaking and chipping off the edges, and then by grinding down to a smooth finish.

The old method of grinding down the lenses on an ordinary emery wheel under water was also employed, but this proved too slow where there was considerable grinding to be done. It was only after various unsuccessful attempts of this kind were made—which resulted in more broken than good lenses—that a satisfactory solution of the problem was found in the sand blast as the cutting medium.

The lenses in question, as described in *Compressed Air Magazine,* were of non-standard size, being 1 inch thick and 6¼ inches in diameter. They were urgently needed; and, with the sand blast, were readily cut from lenses of larger size at a saving. An accurate account of the cost of the work showed that five lenses were cut at a total outlay of $4.50, while the average time consumed in assembling and in cutting one lense was about ten minutes.

The glass to be cut is first covered on both sides with pieces of paper or cardboard, preferably the latter, over which are placed steel or cast-iron disks of the required size. All of these are then held together with an ordinary screw clamp. In fitting the disks, care should be taken to have them perfectly level, inasmuch as the lens will crack in the cutting operation if they are not level. When cut half through, the lens should be turned over and cutting continued from the other side. This tends to prevent concaving the edge, and thus renders a smooth finish and eliminates grinding.

*Compressed Air Magazine, Vol. 28, No. 10 (Oct.) 1923.

Cutting air-port lenses can be accomplished with a sand-blast equipment, such as is installed in all foundries for cleaning castings, without altering it in any way, except that a small nozzle should be used. By this method, any kind of lens, be it of plain, non-shatterable, or wire-inserted glass,

CUTTING THE DEADLIGHTS OF AIR PORTS BY MEANS OF SAND BLAST

The photograph was taken when the reduction of the diameter of the glass disk was partly completed

can be cut with equal facility and economy. The procedure is susceptible of several refinements, such as jigs and flat nozzles, where quantities of lenses of the same size are desired, or where several lenses are to be cut from the same piece of glass.

Chipped lenses, which otherwise would be a total loss, can now be salvaged by cutting them down to the next smaller size.

"He Loved the Stars"*

An autobiography of John A. Brashear, the famous scientist and lens maker, written at odd moments during the last eight years of his life, will be published shortly by the American Society of Mechanical Engineers, which organization he served for a term as president.

At the time of Dr. Brashear's death the autobiography was unfinished, but his great store of personal correspondence furnished ample material for the completion of his life story. William Lucien Scaife, a long-time Pittsburgh friend of Dr. Brashear's, supervised the editorial work on the book, which is published by the Society under the guidance of the following committee: Joseph Buffington, George Ellery Hale, Charles M. Schwab, Ambrose Swasey, Benjamin Thaw, and William Lucien Scaife.

The story of "Uncle John" Brashear, as he was affectionately called by literally thousands, is above all a romance. So is the story of almost any successful man. America, the land where all men are presumably born free and equal, where the immigrant can attain to anything but the Presidency and the poorest native-born need stop not even at that, America is full of romances. But among them all stands a unique figure, the simple, kindly figure of John Alfred Brashear.

For here was a man who, in an age so commercial and materialistic that success is more often than not measured in dollars and cents, remained steadfastly true to an ideal of perfection with utter disregard of material gain or loss; a man who was blessed with a love of beauty which kept him continually striving the while it tempered him into a concrete expression of that love itself. His is a unique figure, not be-because he fought and won from life success in a chosen work, though he did that nobly, but because life gave her gifts to him so generously.

Talk with any one who knew him and you will hear, not what he did, but what he was. Remarkable, indeed, when you stop to consider that in the making of astronomical lenses and instruments of precision he was the peer of any man of his time, and this not in America alone, but in Europe as well. Crusty old scientists came to him first because his genius could aid them in their work; they returned because they loved him. The inexperienced amateur wrote to him hesitatingly for help, and a correspondence ripened into a deep friendship which produced important investigations and discoveries in the scientific world. He had the supreme gift of giving himself, and the world is immeasurably richer because he gave himself so generously. For great as was his genius, far greater was the man.

Mechanical genius he certainly had. His numerous technical papers undoubtedly contained valuable contributions to scientific knowledge. But genius of this kind cannot explain why a man without formal education should, in the twentieth century, be chosen acting chancellor of a large university, or why he should be selected by Andrew Carnegie to have such a large share in the work of making and executing the plans for the Carnegie Institute of Technology. Mechanical genius cannot explain why Henry C. Frick, when he wanted to give a half-million dollars for educational purposes in Pittsburgh, should have selected John Brashear to handle the fund, a man whose entire life had demonstrated his inability to grapple successfully with financial and business problems. There was a genius other than mechanical which made John Brashear Pennsylvania's "best-loved citizen," the intimate of millionaires and paupers, of scientists, educators, and untutored workmen, the friend of the newsboy, the natural, easy playmate of little blind children. It was the genius of a rare personality.

The story of a modest millwright who was led by his love of the stars to a career of great service for science and mankind will be a source of inspiration to the generations to come.

In the chapter on the Making of the Twelve-Inch Reflector, from which the excerpts below are taken, we get glimpses of his great sacrifices and the strenuous efforts he exerted after the long day in the iron mill to make a telescope that would reveal the beauties of the heavens not only to him and his wife, but to all his neighbors and friends, for his great joy was in sharing with others. This chapter shows his painstaking care, his perseverence to success through great difficulties, and it reveals the devotion of his wife who was so much a partner in his life.

*From advance proofs of *Mechanical Engineering*, September, 1924.

Making the Twelve-Inch Reflector

BY JOHN A. BRASHEAR

During the winter of 1877 we procured, through Heroy & Marrenner, of New York, glass disks for the reflecting telescope which we had decided to make after my first talk with Professor Langley. We decided to make it of as large diameter as we could handle in the little shop; so we fixed upon twelve inches as the maximum diameter of the glass. It was not difficult to procure the disks, nor were they very costly; so, fearing a repetition of my unfortunate accident in breaking one of the object-glass lenses, we ordered and received two very excellent disks.

A focal length of ten feet was decided upon, and the grinding and fining tool readily prepared for commencing the work. The emery was washed for the different grades, and the disks were cut out of the square plates—just how I cannot remember at this writing. So Ma and I commenced the work that was to take we did not know how long. It all had to be done after my daily work at the mill, and it would not, it could not have been done without the deep and abiding interest of my wife. But it required many months of labor before we had carried the work far enough along on the reflecting telescope mirror to do the polishing and testing.

Unfortunately, I had no place where I could make these tests except the open space under the house, and this had to serve the purpose for the completion of the twelve-inch. After many nights of polishing, figuring, and testing, I concluded that the glass was as good as I could make it under the conditions of temperature changes that it had to undergo in working it in the little shop and testing it under the house. One of my greatest mistakes or blunders was that owing perhaps to the limited time at my command each evening, I did not wait long enough after polishing to see the effects when the increased temperature caused by the polishing had subsided or distributed equally in the mass of the disk. This can be explained to the reader, unacquainted with the delicate methods employed in testing an accurate surface, in this way: If the warm hand were pressed upon such a surface as I am describing for, say, ten seconds, and if the glass was a few degrees cooler than the hand, a cameo of the hand could be raised on the surface. If then the surface were polished before the raised impression of the hand had subsided, this raised figure would be polished off; and then, when the glass would come to a normal temperature, there would be an intaglio or depressed figure of the hand, instead of the raised or cameo figure we had before. This fact is well known to all opticians who have to deal with accurate instruments.

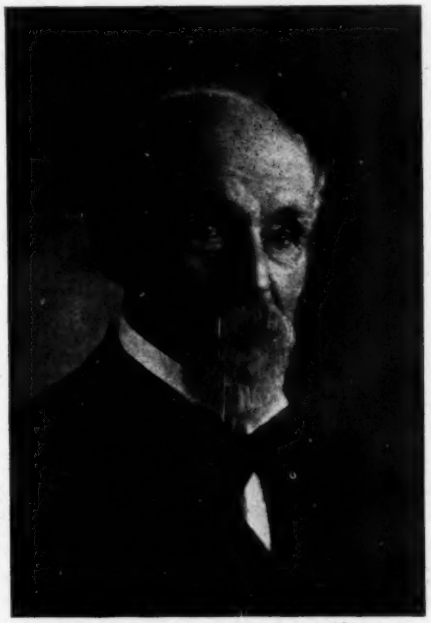
But at last our twelve-inch was ready to receive its coat of silver. A splendid tube had been made ready for me by my young friend Edward Klages, a carpenter by trade; and I had made a pattern and had a casting made, with a temporary though rather light equatorial mounting for it. This was set upon a brick foundation and a platform built around it so that observations could be made within our sky limits, which, unfortunately, were restricted in the south and southeast. But we had a fair portion of the sky at our command.

There were several known methods for silvering front surfaces, but at the time my own knowledge of chemistry was limited and I found that the chemist I consulted could give me but little information on silvering the front surfaces of glass, though quite a number of processes for silvering the inside of mirrors, like reflectors, looking-glasses, etc., were known. Dr. Draper's modification of the Cimeg Process was tried time and again; and as silver was a pretty costly affair for me, I was much discouraged, though at times I succeeded in getting a fair, but not satisfactory, surface of silver.

The mirror had already been tried on the moon with its unsilvered surface, and while its light value was only about one-eighth of what it should be, the defining powers were very promising.

My attention had been called by an English friend in the Adams mold shop to a journal printed in London called the *English Mechanic and World of Science;* I borrowed a few numbers and found there a method of silvering by a process requiring heat. So my wife and I prepared to make a trial of the new process. I found everything in readiness when I came home from the mill; and after supper we went to the little shop where the water was soon warmed in the containing vessel by steam heat from the boiler, as rigorous cleanliness in all the processes had to be observed. We had poured the silver solution with its reducer to change it to the metallic form; and you can imagine our delight and joy when we saw a beautiful deposit of silver covering the surface.

But, alas, alas, our joy was soon turned to sorrow, to grief, to keen disappointment that never could be described in words, when we saw and heard our disk crack from edge to center. Not to this day have I determined the real cause of the disaster, although two causes might explain it: unequal heating of the mass of the glass (but this was done so carefully that the second explanation may be more satisfactory) or the possibility that a jet of cold air, coming through a crack in the side of the workshop and impinging upon one side of the glass, cooled it at one point, and hence the rupture.



JOHN ALFRED BRASHEAR

I do not like to write about this second disappointment in our optical work when we appeared to be just at the climax of success; for this last failure seemed to affect me more than the first one. Failure after all these months, and just when we had reached the goal. What visions I had destroyed in a moment. One of them was the wonderful view I should have of the planet Mars, then coming into the best position for observing that it had been or would be in for years. It was the year 1877, when Professor Asaph Hall discovered the two satellites of the planet.

If I remember correctly, I slept little or none that night, though my dear wife tried her best to cheer me by saying we could finish another glass, as we had both the disk and the experience. I went to the mill the following morning; I walked around like a crazy man; I could not collect my thoughts or concentrate them upon anything. In fact, I think it would have been a godsend if there had been a breakdown in the machinery that day to take my mind off that broken mirror.

About four o'clock in the afternoon I stopped and pondered for a moment, and this expression came from me, and could almost have been heard, I am sure, had there been any one near me: "What a fool you are, to worry this way; this worry will never mend that broken glass." I am not certain that I was a believer in telepathy then, or that I am now, but somehow I felt in my innermost soul that something was going on at home. I started home as early as possible that evening, and as I climbed the hill it was not with the same heavy heart that I had as I walked down it that morning. As I opened the door I was met with a smile and a kiss, and then dear Ma asked me to go out to the little shop before we sat down to supper. I thought possibly something unfortunate had happened out there. But instead, what did I see? The little shop in prime order, a fire burning under the boiler, engine oiled ready to start, and the extra disk in the lathe ready to have its edge turned with the diamond tool and its surface roughed out to the approximate curve. Could any one have done more? The memory of that moment, filled with the love and confidence of the one who was more than life to me, I can never forget. To make a long story short, in about two months from that evening, in the early spring of 1878, the new twelve-inch mirror was ready to be silvered.

I had made quite a number of experiments with various methods of silvering by this time, and at last I found a method, or rather a modification of a method, which I had seen in the *Scientific American,* called Burton's Method, by which I succeeded in obtaining most admirable results in silvering mirrors on the front surface, although it was originally intended for back surfaces, looking-glasses, etc. So simple, so certain was this method, that I at once sent a communication to the *English Mechanic and World of Science,* describing it in full for the benefit of my amateur friends, of whom there were at that time, literally speaking, scores who were trying to make their own reflecting telescopes.

Little did I think at the time that this method would become the method, and be universally used for front-surface mirrors. The formula has been published in perhaps every chemical journal in the world; and although I am writing this note more than forty years after I had the pleasure of giving it to the world, without money and without price, I often have pleasant reminders of the value of my first humble contribution to makers of reflecting telescopes.

Almost forty years later I stood in the laboratory of the Mount Wilson Observatory, admiring the beautiful silvered surface of the great one-hundred inch reflecting telescope mirror, made by my old-time friend Professor Ritchey. Expressing my pleasure to him, he replied: "Well, it was silvered by Brashear's Process." Many other methods have since been devised; but I know of none more certain and more easily applied. I think we silvered the surface of the great seventy-two-inch mirror for the Dominion Observatory at Victoria, British Columbia—made by Mr. McDowell at our workshops and finished in April, 1918—in just about two hours and thirty minutes, including the operations of cleaning, mixing chemicals, and final polishing of the surface.

It can readily be seen from this description that there was no more experimenting on the new twelve-inch mirror; and, after a beautiful bright coat of silver was deposited upon its surface, and upon that of the small flat diagonal mirror for reflecting the beams from the central cone to the side of the tube, as in the Newtonian type of telescope, we were ready for the first clear night and our first look at the heavens.

I am sure that I did not audibly express a soliloquy at the sight that met my eyes as I placed the telescope on the Star Cluster in Perseus, the Nebula in Andromeda, the binary star Albireo in Cygni. I shall never forget that first night with the twelve-inch which Ma and I enjoyed, not ourselves alone, but also our neighbors around us.

I cannot pass over this period of my struggles without stopping long enough to pay tribute to my good friend Dr. Henry Draper, who gave me some of my first words of encouragement. I had become acquainted with him through correspondence, as mentioned before, and he was never too busy to answer my letters in such a way as to help me solve the problems which were troubling me in the work I loved. His letters found me a toiler in the rolling mill, and together with his researches and his work on The Construction of a Silvered-Glass Telescope and Its Use in Celestial Photography, they opened a new world, a new heaven to me, and I know I was only one of the many earnest toilers of science befriended by his great heart. Indeed, his book was of almost inestimable value to hundreds who were enabled to make their own instruments through a knowledge gained by studying it.

The Glass Industry

The First Technical Trade Journal Devoted Primarily to Glass Technology, Engineering, Raw Materials, and Glass Factory Equipment and Operation.

Published Monthly by the
GLASS INDUSTRY PUBLISHING COMPANY, INC.
50 Church Street, NEW YORK

Telephones { Cortlandt 2465 / Cortlandt 5618 — Cable Address, Glasdustry

J. B. KRAK, Technical Editor

Subscription Price.....$2.00 a Year
Single Copy.....20 Cents

THE GLASS INDUSTRY circulates extensively among American and foreign glass manufacturers, their business executives and technical and factory operating staffs.

ADVERTISING RATES SENT ON REQUEST

Vol. 5 NEW YORK, SEPTEMBER, 1924 No. 9

CONTENTS

	Page
Some Aspects of Tank Block Corrosion	161
Some Glassmakers' Problems and How They Were Solved	162
Dr. Shively on the Use of Alumina in Glass	165
The Commercial Decoration of Glass Articles	166
Cutting Air-Port Lenses with Sand Blast	167
"He Loved the Stars"	168
Editorial:	
Refractory Materials for the Glass Industry	170
Technical Consultation Service:	
Re-silvering mirrors	171
Glass chemist	171
Recent Patents	172
New Publications	174
The Glass World and What It Is Doing:	
A Dangerous Word	175
Window Glass Prices Reduced	175
Flint Wage Scale Not Completed	176
Few Hand Plants Will Be Active	176
One Hundred Years of British Glass Making	176
Department of Glass Technology at Sheffield University Proposes New Maintenance Plan	177
Bottle Blowers' Wages Unchanged	177
International Discussion of Glass Works Labor	177
Plate Glass Production for Second Quarter	177
New Plate Glass Corporation	178
Owens Bottle Semi-Annual Report	179
Trade Activities	179
Business Publications	180
Personals	181
Coming Meetings	181
Inquiries Received	181
What the World Wants	181
Stock Quotations	181
Current Prices of Glass-Making Materials	182
Monthly Summary of United States Foreign Commerce in Glass	182

CLASSIFIED BUYERS' GUIDE, PAGE 16
INDEX TO ADVERTISEMENTS, PAGE 18

Readers of THE GLASS INDUSTRY in the United States and elsewhere are requested to favor the Editor with any information available from time to time concerning developments in their own or other fields which would be of general interest to the industry. Authoritative facts about new glass manufacturing projects, re-organizations, new factory construction, new processes and equipment, raw materials, manufacturing and market conditions, personal items, and other appropriate subjects would be welcomed.

Those experienced in the practical, technical or executive activities of glass manufacturing who are qualified and willing to lend their aid to the upbuilding and progress of the industry by giving from their store of knowledge to others, are invited to submit for publication articles on any subjects relating to glass which would be of interest and value to our readers. The authors of accepted articles of this kind will be compensated at usual rates.

Refractory Materials for the Glass Industry

The large number of articles on refractory materials which have appeared during the past ten years are witness to the wide interest in this subject on the part of glass manufacturers and scientists. With pardonable pride it may be pointed out that the great majority of these articles have been published in the English language. They have appeared chiefly in the *Journal of the Society of Glass Technology* and the *Journal of the American Ceramic Society*. Contributions from French and German sources have been scarce.

Notwithstanding the large amount of excellent work done, it must be conceded that while much of it is of fundamental importance the direct, tangible results to the glass industry have been small. The fact must be faced that in an industry as highly developed as glass manufacturing, there is not available at the present time a material which will withstand the corrosive action of glass at its melting and fining temperature. Furthermore, there are no indications giving rise to the expectation that this problem will be solved along the lines laid out by present day investigators within a reasonable time.

One of the most striking features of the glass refractories situation is the variance of opinion as to what causes corrosion and the difference in the ways and means advocated to effect its prevention. Some authorities advise insulation as a method of protection. Others just as well qualified advance plausible reasons to prove that the cooling of tank blocks will prolong their life.

Whatever may be the final outcome of these controversies it is certain that nothing will aid more to clear up the situation than a free expression of opinion on the part of those qualified to speak. From the interchange of the various views a way will be found to solve this difficulty with which the glass industry has to contend. In the present day of high temperatures and large tonnage the need for good refractories is even more pressing than in the past.

In this department as in the matter of batch composition there still remains some of the secrecy of a kind which harks back to times now happily overcome by progressive manufacturers. It is very probable that a number of mysterious formulæ "inherited from grandfather," kept with great secrecy, are entirely at variance with the best modern practice and are a source of loss rather than a valuable possession.

There can be no doubt that an American Glass Research Association, supported by glass makers in this country, the creation of which has been advocated in these columns, would be able to render valuable service to manufacturers in the field of refractory materials for the glass industry.

It Still Comes High

The cost of living, on May 15, 1924, according to figures issued by the National Industrial Conference, was 21.1 per cent below that of July, 1920, at which time the peak of the rise since 1914 was reached. The increase in the cost of living from July, 1914, to May 15, 1924, was 61.4 per cent. The purchasing value of the dollar, based on the cost of living in May, 1924, was 62 cents as contrasted with one dollar in July, 1914.

Technical Consultation Service

THE GLASS INDUSTRY invites its readers to refer to this department any problems with which they may be confronted pertaining to raw materials, glass technology, laboratory and factory practice. While making no pretensions to the possession of unbounded knowledge or infallibility THE GLASS INDUSTRY is ready to assist its readers to the best of its ability in solving their problems. Readers who can offer better suggestions than those printed are invited to submit them. Questions should be submitted in writing and will be answered by mail as promptly as possible. The sources of all inquiries will be held in strict confidence.

Question 59.—Re-silvering mirrors. Will you please tell us the method and materials used in the re-silvering of mirrors?

Answer*—Reliable methods of re-silvering mirrors were described in an article in *The Metal Industry*, written by Charles H. Proctor. The article is reproduced below.

Re-Silvering Mirrors

The silvering of plate glass to be used as mirrors is a commercial art in itself. To produce a product of the highest grade requires skill and experience, and men are trained especially for the purpose.

The mere act of pouring a chemical combination upon the glass which precipitates the silver as it comes in contact is not all there is to the silvering of the glass. The preparation of a chemically clean surface is one of the first principles to be followed for successful results. The next factor is the arrangement whereby the silvering mixture can be permanently held upon the glass during the silvering operation. The correct temperature (about 80 to 100° F.) must be maintained. Mechanical motion must be applied so that the solution is moved very gently to and fro during the silvering operation. Adjustable wooden frames lined with soft sheet rubber are used for silvering of the frames. The rubber does not need to cover the entire frame but only the bottom and possibly an inch up the sides and ends. The rubber can be tightened up when the frame is made so that it is practically water tight. Cypress wood makes the best frames. The wood, however, should be coated with an asphaltum paint both outside and inside, extending down to the rubber inside the frame. To give mechanical motion, rollers may be arranged so that a gentle to and fro motion results or a rocking frame may be made.

In refinishing mirrors, the silver should all be removed first. As nitric acid is the most efficient acid for dissolving of silver, a heated mixture of 1 part nitric acid and 1 to 2 parts of water applied to the heated glass will readily dissolve the silver.

The nitrate of silver held in suspension by reducing with the acid should be saved as the silver can be recovered. After removing the old silver coating, wash the glass thoroughly with clean cold water.

Before proceeding as outlined, the various solutions to be used in the silvering method should be previously prepared as follows:

SENSITIZING SOLUTION

Distilled Water	1 quart
Chloride of Tin Crystals	½ oz.

SILVERING SOLUTION NO. 1. STOCK SOLUTION

Distilled Water	20 fluid ozs.
Pure Nitrate of Silver Crystals	3 ozs.
26° Aqua Ammonia	2 ozs.

To prepare the solution, dissolve the nitrate of silver in part of the water first at a temperature of 100° F. Then add the balance of the water, then the ammonia. A brown precipitate will result which will redissolve. The solution should be filtered by the aid of a glass funnel and chemically prepared filtering paper.

SILVERING SOLUTION NO. 2. REDUCING SOLUTION

Distilled Water	5 ozs.
Tartaric Acid Crystals	1 oz.

Filter the solution as outlined above.

SILVERING SOLUTION NO. 3

Used in Silvering Operations

Stock Solution No. 1	1½ fluid ozs.
Distilled Water	16 fluid ozs.
Reducing Solution No. 2	⅛ fluid oz.

Stir the solution thoroughly with a glass rod. Any proportions may be made upon the above basis. Keep each combination separately in dark colored bottles away from the daylight or sunlight, mixing them only as required for use. Some men claim the best results with the tartaric acid solution as given. Others prefer the Rochelle Salt solution so we give both types.

ROCHELLE SALTS SILVERING SOLUTION

Solution A

Distilled Water	5 ozs.
Pure Nitrate of Silver Crystals	1 oz.

When the nitrate of silver is dissolved, add 26° aqua ammonia until the brownish precipitate formed is just redissolved. Now add more distilled water to make up a total of 100 fluid ounces.

Solution B

Distilled Water	20 ozs.
Grape Sugar	2 ozs.
Rochelle Salt	2 ozs.

When the materials are all dissolved, then add ½ oz. of pure nitrate of silver crystals previously dissolved in 2 ozs. warm distilled water. The solution should be boiled in a white enameled receptacle for about half an hour, replacing the water lost by evaporation. The solution should cool to normal temperature. It is advisable to filter the solution as previously outlined. When ready to perform the silvering operations (but not before), mix solutions A and B.

After removing the old silver and washing with water, drain thoroughly, then flow over the glass a little of the sensitizing solution, drain thoroughly and repeat the water washing. Now flow over the glass the silvering solutions previously prepared from the tartaric acid or Rochelle salt combinations. The solution should remain upon the glass for about 20 minutes then remove the solution, which contains some silver and should be saved, and then gently wash with clean water.

The silvered surface should now be allowed to dry thoroughly and should be then backed up with an alcoholic shellac varnish which may be colored with metallic red or lamp black. The varnish should be flowed over the surface. The backing up completes the silvering operations.

In silvering new glass, the surface must be chemically clean. The use of mild alkali cleaners to remove any surface coating of a greasy nature is advisable. For cleansing, 4 to 8 ozs. of the respective cleaners dissolved in hot water will prove effective. Apply by sponges or flowing over the glass. Wash the glass afterwards thoroughly with water, then flow over the glass a mixture of 1 part nitric acid and 8 parts water.

Rewash thoroughly and then proceed with the silvering operations as outlined. Quite frequently new glass will show a cloud of reflected light. This cloud is claimed to be due to lead in the glass. Such a cloud can readily be removed from the glass by flowing a solution of hydrofluoric acid over the glass.

The hydrofluoric acid solution should consist of hydrofluoric acid 1 part, water 8 parts. The glass should be thoroughly washed following this operation.

Question 60.—Glass Chemist. Could you advise us by return mail of some person who is now acting as chemist for several different factories? We have never employed any one to analyze our sand or any of our other raw materials and we have now reached the stage that we must do something, as we have added automatic machinery throughout our plant and since our production will be very much increased we do not want to pile a lot of ware in our yard which might not stand up for the different consumers.

Answer.—We are always pleased to refer readers to competent glass chemists and engineers.

*A paper published in the December, 1921, issue (pages 291-293) of THE GLASS INDUSTRY outlines the five best known processes of silvering. Detailed working instructions are given for two of the methods—the Rochelle Salts Process and the Brashear Process.

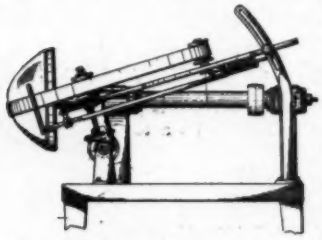
Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Copies of United States Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

Glass-Polishing Machine. U. S. 1,502,136. July 22, 1924. Charles W. Dake, of Chicago, Ill., assignor to the Pyle-National Company, of Chicago, Ill.

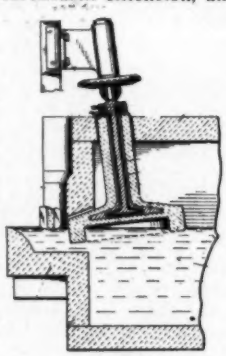
One object of this invention is to provide a new and improved form of automatic machine polisher which will polish the bowl without changing its shape. and without any tendency toward opening up or enlarging the tool marks which may be present.



The bowl or the work to be polished is brought into engagement with the chuck, air is exhausted from between the work and the chuck to hold the work in position, the tension on the spring withheld pulley is released, the drive pulley and the idler pulley are properly positioned, the belt is put in place guided by the three pulleys and extending around the work, the tension on the spring is properly adjusted and the angle of inclination of the polishing frame is adjusted until the belt properly engages the work, the driving means are then thrown into operation to rotate the work and drive the belt.

Glass-Circulating Mechanism. U. S. 1,502,068. July 22, 1924. Leonard D. Soubier, of Toledo, Ohio, assignor to the Owens Bottle Company, of Toledo, Ohio.

The inventor claims combination of a furnace to contain molten glass, said furnace having a forehearth extension, and comprising a concave wall or jack arch above said extension, whereby the glass in the forehearth is exposed for gathering, means for circulating the glass past the gathering point comprising a disk-like head within the tank, a stem projecting upward therefrom through the roof of the furnace, said stem being perpendicular to said head and forwardly and upwardly inclined so that said head is inclined with its forward portion dipping deeper into the glass than the rearward portion, and means to rotate said head about the axis of said stem.

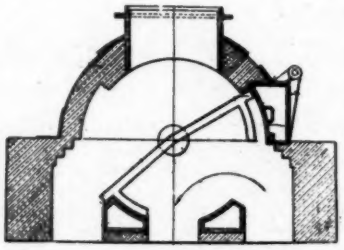


Evacuated Container. U. S. 1,498,908. June 24, 1924. Colin G. Fink, of East Orange, N. J., assignor to General Electric Company.

This invention relates to seals for leading in conductors for incandescent lamps, gas electric lamps, mercury rectifiers and apparatus of a similar nature in which an envelope of glass or vitreous material is used and in which it is necessary to provide means for conducting electrical energy from a power circuit to conductors within the space enclosed by the envelope. Platinum has been found especially suitable for a leading-in conductor. Because of the great cost of platinum, however, many efforts have been made to secure a suitable substitute. By making a composite conductor having a sheath of copper or cobalt and a core of metal having a lower coefficient of expansion than that of glass, and by properly proportioning the relative thicknesses of the core and sheath, it is possible to provide a conductor, the total radial coefficient of expansion of which is substantially the same as that of the glass with which it is to be used. The inventor claims that in actual practice it has been found that by using his invention the number of defective seals has been reduced over 75 per cent from the number commonly found when platinum is employed.

Reversing Valve. U. S. 1,502,513. July 22, 1924. Russell G. Miller, of Pittsburgh, Pa.

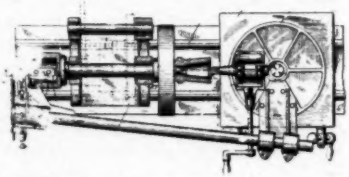
This invention consists of an improvement in reversing valves for controlling the circulation of gases and air in furnace construction and use.



The inventor claims a reversing valve comprising a casing having an inlet port, a middle outlet port, and outer circulation ports, and a pivotally mounted water cooled valve extending transversely across within the casing adapted to alternately open and close each circulation port with relation to the inlet and outlet ports respectively, and having water cooled lateral extensions adapted to be located alternately between the outlet port and either circulation port.

Device for Making Fluted Glass Molds or the Like. U. S. 1,502,474. July 22, 1924. Peter Kucera, of Connellsville, Pa., assignor to Capstan Glass Company, Connellsville, Pa.

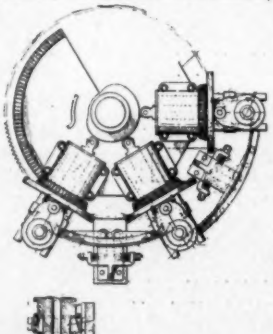
This invention relates to a device for making fluted block molds for glass tumblers and the like. The principal object is a device adapted to automatically cut the matrix of a configurated block mold by causing a forming tool to move under control of predetermined pattern devices.



A further object is a machine for shaping the interior of hollow objects in accordance with predetermined pattern devices which are moved consonantly with the relative movement between a forming tool and the side wall of the object being shaped.

Machine for Making Bottles. U. S. 1,502,560. July 22, 1924. Warren E. Glaspey, of Bridgeton, N. J., assignor to Spring Stopper Company, of New York, N. Y.

This invention relates particularly to machines for making bottles, or similar containers, which are provided within the mouth-portion with an internal screw thread.

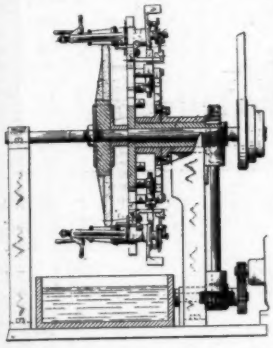


The inventor claims in a machine of the character set forth, the combination with a mold-carrier and a series of molds carried thereby, of a mandrel for each mold having screw connection with the mold-carrier and provided with a threaded extremity adapted to project into the mold cavity, a gear-element on each mandrel, a blow-head disposed above the path of said molds and adapted to co-act therewith, a bubble blow-head disposed beneath the path of said tubular mandrels and adapted to co-act therewith, and yieldingly mounted racks disposed on opposite

sides of the path of the gear-elements, one of said racks being mounted in advance of the glass charging station and the other being mounted between the glass charging station and the bubble-blowing station.

Glass-Cutting Machine. U. S. 1,502,990. July 29, 1924. Edward J. Kiefer, of New York, N. Y.

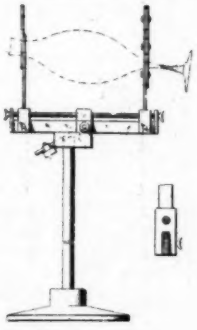
This invention has for its object to produce an improved machine for the rapid cutting of ornamental designs on glassware, such as tumblers. The tumblers are supported by suitable devices in a circular series upon a rotary carrier and are moved into and out of contact with a concentric grinder, each tumbler receiving a partial rotation upon its own axis at each operation so that it shall complete a rotation upon its own axis as it completes a revolution about the axis of the grinder. By such movement the tumbler is brought into contact with the grinder in a circumferential series of spots and will have ground upon its surface a circumferential series of spots, the character of which will depend to some extent upon the movement and timing of the movement of the tumbler with respect to the grinder and its own axis.



Catching-Off Machine. U. S. 1,503,188. July 29, 1924. Pierre Hoyoux, of Rochester, Pa.

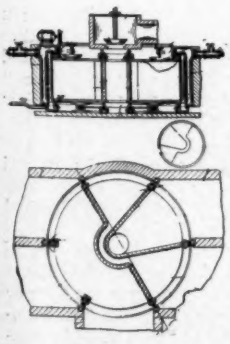
The primary object of this invention is to provide means for handling goblets as they come from the finisher so as to render it unnecessary to employ "carrying in" boys, thus reducing the labor expense and producing goblets at a low cost.

The invention consists of a device of the class described comprising a supporting stand, a cross bar pivotally arranged therein, an adjustable weight for holding the cross bar in horizontal position, a pair of uprights slidably arranged on the cross bar, screw shafts for adjusting the uprights towards and away from each other, a holder carried by each upright, each holder being of substantially U-shape and one holder having a movable part for permitting the top of a goblet to be inserted therein.



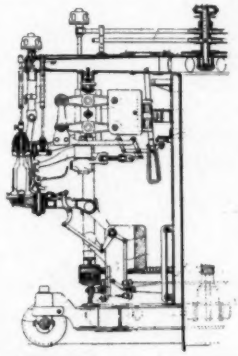
Gas and Air Reversing Valve. U. S. 1,501,552. July 15, 1924. William G. Bergman, of Point Place, Ohio.

This invention has for its particular object to provide a valve which is so located with respect to the passageways that there will be a direct flow from the passageways when they are used as the outlet for conveying gases to the stack, thereby reducing the friction and producing a direct draft and reducing the amount of the solid products of combustion that would collect particularly in the valve. Provision may also be made for a direct flow from the source of supply to one or another of the passageways. The valve is so constructed that it may be located within the defining planes of the top and bottom and substantially within the planes of the sides of the passageways through which the gases are directed to and from the furnace. The invention also provides an efficient sealing means whereby substantially vertical registering walls of the passageways and the chambers of the valve may be sealed.



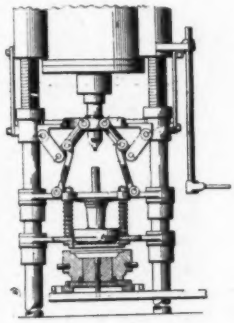
Machine for the Manufacture of Glass. U. S. 1,499,522. July 1, 1922. Robert Frederick Hall, of Moseley, near Birmingham, England.

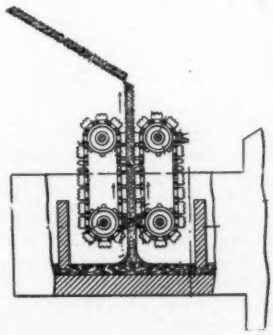
The inventor claims in a machine for the manufacture of glass articles, the combination of an upper rotatable member, a lower rotatable member, and a number of glass article making units, each comprising a hollow elongated loop, the said loop being in communication with a source of air, lever mechanism at an upper level, pivoted to the said loop and carrying a parison mold and its associated parts, lever mechanism at a lower level pivoted to the said elongated loop and carrying a finishing mold and its associated parts, and means for supplying the cooling air from the interior of the elongated loop to the finishing molds and parts to be cooled, substantially as described.



Glassworking Apparatus. U. S. 1,501,868. July 15, 1924. Jesse M. Said and David E. Gray, of Corning, New York, assignors to Corning Glass Works, of Corning, N. Y.

This invention is to provide improvements in the plunger actuating mechanism of glass pressing machines. In the specific embodiments chosen for illustration purposes, the invention comprises the use of floating levers and links which are interposed between the bottom of the fluid pressure cylinder of a glass working apparatus and the plunger cross head, said levers connecting the piston rod depending from the cylinder to the plunger cross head, so that increased pressure will be imparted to the plunger, as the piston rod descends. In this manner novel means are provided for utilizing low fluid pressure to obtain sufficient plunger pressure so that better results are obtained in the finished articles.





Method of Drawing Sheet Glass. U. S. 1,505,584. August 19, 1924. Hudson S. Campbell, Clarksburg, W. Va.

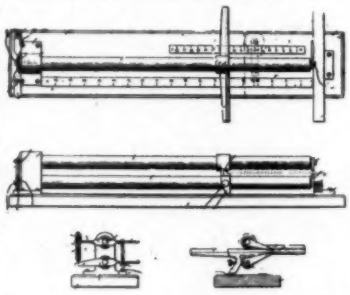
The inventor claims a method of forming sheets of glass consisting in drawing the sheet continuously from a bath of molten glass, severing the glass, gripping the succeeding sheet simultaneously with the severing just below the point of severing, and gripping the side edges of the sheet at intervals to keep the sheet taut, all while in a plastic condition.

Method of Ornamenting Glass Articles. U. S. 1,492,402. Apr. 29, 1924. Thomas Skinner, of Hammonton, N. J.

The inventor's claims include an article of glassware having a recess formed in the outer surface thereof, a plurality of substantially hemispherical jewels permanently united to the article of glassware within said recess with the flat faces of the jewels contacting the bottom of the recess, the bottom of the recess being of curved cross sectional form, and the jewels being of increasing diameters from the shallower to the deeper portion of the recess with the outer surfaces of the jewels lying flush with the outer surface of the glassware.

Cutting Device for Glass and Other Articles. U. S. 1,504,696. Aug. 12, 1924. Clfiton R. MacLean, of Stoughton, Mass.

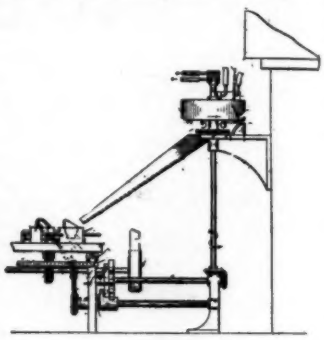
One object of the invention is to provide a glass cutting device having means for supporting a plate of glass, or other article, to be cut and comprising a pair of cutting instrumentalities to engage the opposite faces of the plate of glass, or other article, to be cut and provided with means for forcing said cutting instrumentalities against the faces of the glass with equal pressure irrespective of the weight of the article to be cut.



A further object is to provide adjustable means for enabling disks of different diameter to be cut from a plate of glass.

Machine for Forming Glass Articles. U. S. 1,505,537. August 19, 1924. Henry M. Brookfield, New York.

The inventor claims in an apparatus for forming articles of glass, in combination with means for feeding molten glass in a continuous unconfined stream, of a distributor for dividing said stream into separate masses to be subsequently delivered to molds, said distributor comprising a horizontally rotatable table provided with a series of vertically walled openings therethrough, means for intermittently rotating said table to bring said openings successively into line with said stream of molten glass, and a stationary shear member adjacent to the stream of glass and to the upper surface of the table and adapted to co-operate with the upper end of each opening to sever the stream of glass and carry it over the intervening table surface to the succeeding opening as the table makes its intermittent movement of rotation.



New Publications

THE VISCOSITIES AND SURFACE TENSIONS OF THE SODA-LIME-SILICA GLASSES AT HIGH TEMPERATURES, by Edward W. Washburn, George Reed Shelton and Earl E. Libman. Bulletin No. 140. 75 pages. Engineering Experiment Station, University of Illinois, Urbana, Ill.

Part I treats of the viscosity of glass at high temperatures. After outlining the scope of the investigation, the history of the study of viscosity is given, then follows the method and apparatus used in the experiments, preparation of the standardizing liquids and study of the rotating-cylinder method for liquids at high viscosity, calibration of the porcelain pots and stirrers and discussion of the results.

Part II relates to the surface tensions of glass at high temperatures. Previous work on this problem is referred to, preliminary studies made of the subject are described, also the apparatus and experimental procedure. The results of the study of surface tension of the soda-lime-silica glasses are given. A modified method which eliminates the necessity of knowing the density of the glass when determining surface tensions is described. The change in surface tension with temperature is discussed.

The principal results of the investigation are as follows:

(1) An apparatus was devised for the rapid and accurate measurement of the surface tension of molten silicate glasses at high temperatures. The apparatus consists of a cylinder of platinum foil suspended immediately above the liquid glass, the suspending wire passing out through a small opening in the top of the furnace and being in turn attached to the bottom of a sensitive vertical spiral spring. On raising the pot of glass until contact is made with the bottom edge of the platinum cylinder, the cylinder is drawn into the surface of the glass until the surface tension forces are balanced by the extension of the spiral spring. By measuring the extension of this spring with a cathetometer, the surface tension of the glass can be calculated. The equilibrium position of the cylinder in the glass surface can be approached from both directions with the same result. The apparatus was calibrated by using liquids of known surface tensions.

(2) With this apparatus the surface tensions of fourteen glasses were measured at 1206 and 1454 deg. C. respectively. The values obtained varied from 128 to 167 dynes per cm. depending upon the temperature and composition of the glass.

(3) Surface-tension—space models were constructed for each of the two temperatures and projections of a series of lines of constant surface tension were prepared for each surface. From these projection diagrams the surface tension of any glass within the range of compositions covered by the investigation may be obtained for each of these temperatures. All the commercial soda-lime-silica glasses were investigated.

(4) The temperature coefficient of the surface tension at the temperatures measured was found to be very small, varying between 0.02 and 0.04 per cent per degree centigrade.

Copies of the Bulletin may be obtained from the University of Illinois at 45 cents each.

TECHNICAL WRITING. Second Edition. Rewritten and enlarged. By T. A. Rickard, formerly editor of the *Engineering and Mining Journal, The Mining Magazine* and the *Mining and Scientific Press.* Contributing editor to the *Engineering and Mining Journal-Press.* Size, 5 by 7¼ inches, 337 pages. Bound in cloth. Price, $2.00 postpaid. Published by John Wiley & Sons, Inc., New York. The first edition of this book met with such a favorable reception that a second edition, re-written and enlarged has been issued. The habit of using good English is not only a most necessary one for writers of technical articles, but is a most valuable asset to other engineers, chemists and technical men, business and factory executives and similarly situated persons who have occasion, more or less frequently, to make reports on technical subjects. The extraordinary qualifications and long experience in technical literature of the author of this work has enabled him to write a book which is not only crowded with valuable information, ideas and suggestions, but is also interesting. The twenty-seven chapters discuss the subject all the way from general principles through construction, punctuation, composition, etc., to style. The ordinary difficulties encountered by beginners, such as the proper use of the words "that," "shall" and "will," and the hyphen in technical terms, are discussed. This work has been criticised by some technical writers who claim that the author goes to the extreme in splitting hairs over disputed points, but whether or not the criticism is justified the book is an important and useful piece of work which any writer will find interesting and stimulating.

CHEMICAL SYNONYMS AND TRADE NAMES. A dictionary and commercial handbook. By William Gardner, works chemist. 280 pages, 6 by 9½ inches. Price 25 shillings, net. Published by Crosby, Lockwood & Son, London, England.

Modern art and manufacture demands the employment of a vast number of chemicals and materials, which substances are sold and discussed under various synonyms and trade names. In many cases one material may have several commercial designations and, in sonsequence, considerable confusion exists. Moreover the common vocabulary of one particular avenue of trade is often but little known outside.

To supply a ready reference to such synonyms and trade names is the object of this dictionary. The book contains approximately 14,000 definitions and cross-references.

The Glass World and What It Is Doing

News of the Industry

A Dangerous Word*

Probably the most abused words in commercial phraseology are "agent" and "agency." The improper use of these words is so universal and is fraught with such peril that it would be well to avoid their use entirely unless there really exists that relationship which in law is contemplated by these terms.

Even well-informed exporters, public speakers at conventions, and writers on export topics glibly use the words "agent" and "agency" where there exists a mere sales arrangement.

An agent is one who undertakes to transact some business or to manage some affair for another by the authority and on account of the latter, and to render an account of it.

If an American manufacturer ships a quantity of merchandise to a person in a foreign country, retaining the property right in this merchandise, with the understanding that all payments received for goods sold are to be remitted to the manufacturer, minus commissions for the sale of the goods, with further provisions for the return or disposal of the unsold balance, there exists a special agency relationship, on consignment basis.

If a manufacturer in the United States, by virtue of an agency contract, authorizes a firm or an individual in a foreign country to transact business for him on commission basis and endows this foreign individual or firm with the authority of acting for him, an agency relation exists. The firm or individual abroad is an agent or representative, with the right of binding the principal within the scope of his authority.

If a manufacturer in the United States finds it advisable for the sake of better merchandising to restrict his sales in a certain territory to one firm or individual, but this firm or individual buys the merchandise outright, this firm or individual is not an agent but a distributor or a privileged customer with exclusive selling rights.

The word 'agent" implies that the manufacturer is trading with the country where the agent is located, and he frequently renders himself liable to foreign taxation because of the existence of this agency. He does not render himself liable to foreign taxation if he sells outright to an exclusive customer or distributor.

The terms "agent" and "agency" and "attorney in fact" are practically synonymous. The vast majority of manufacturers and exporters improperly using the word "agent" with reference to their foreign connections do not think of them as attorneys.

An agent, within the scope of his authority, can bind his principal. Hardly any manufacturer would wish to be bound by the acts of his foreign connections in the manner in which a properly constituted agent can bind his principal. An agent is bound to execute the orders of his principal whenever for a valuable consideration he has undertaken to perform them. In the majority of instances of so-called "foreign agencies" there are no orders by the principal to the agent, but the manufacturer or exporter merely sells to a certain selected house abroad and is not further concerned. His "agent" is not an agent at all.

There generally exists between the American manufacturer and his foreign distributor an agreement with regard to territory, terms, prices, and sales to third parties, in which, in consideration of special efforts by the buyer, the seller will deal through this one privileged buyer. This is far from constituting a principal-and-agent relationship. An agent is responsible to his principal for neglect of duties. No such state of affairs generally exists between an American manufacturer and his foreign distributor. In a genuine agency relationship there exist certain responsibilities on the part of the principal to third parties which are not at all contemplated in the case of mere exclusive sales arrangement or distributor arrangement. The agent has certain rights to be reimbursed for advances and expenses, and his remuneration or commission is for services performed.

The use of the word "agent" is an example of carelessness in the use of an English term which has through practice almost attained the sanction of commercial usage. It has, however, caused any amount of needless litigation and should be entirely eliminated from any or all forms of sales or other agreements unless it is intended to grant those virtually unlimited powers which are implied by the word "agent" in its legal sense.

The employment of the term "agent" and "agency" is unquestionably misleading, particularly to the inexperienced exporters. Manufacturers and exporters who have termed their sales connections in England as agents and later who were called upon to pay an income tax on the profits of the agency, have learned the danger of this word. And when in certain British possessions in the West Indies an attempt was made to tax American manufacturers on profits derived from their agencies they immediately claimed that no agency relationship existed.

A manufacturer who has an agent in a foreign country trades in that country and not with it. Some years ago a number of prominent automobile manufacturers realized the danger of the word "agent" and have adopted the term "distributor."

It is not out of place to voice warning to American firms having agents and agencies abroad so that they may understand the actual relationship existing in order to determine whether they are not improperly using the terms to their own peril and possible loss.

*A. J. Wolfe, in *Commerce Reports.*

Window Glass Prices Reduced

A cut in price of A and B quality window glass, single and double strength, was announced on August 11, by the American Window Glass Company, as follows:

> The following discounts on A and B quality window glass in carload lots, for shipment in Zones B, C, D, E and F, as defined by Zoning Circular of January 25, 1921, to apply on all glass shipped by us from and after August 1, 1924, and until further notice:
>
> Single strength A and B qualities, 25" bracket sizes 88 and 5%; 34 and 40" bracket sizes, 86 and 6%; 50" and above, 85 and 2%.
>
> Double strength—A quality—all brackets, 87%.
>
> Double strength—B quality—all brackets, 88%.
>
> The foregoing discounts are from October 15, 1912, list, f. o. b. factory. Freight will be equalized with Pittsburgh, Columbus, Kansas or such other points as we may deem necessary. Orders and specifications to be subject to our approval. Shipments to be mutually arranged.
>
> The above prices are subject to change without notice.
>
> We guarantee the above prices for each of the said qualities for shipment into any one of the above zones against our own declines up to December 1, 1924, on orders accepted by us for shipment into that particular zone.
>
> The usual boxing charges and fractional cutting charges as outlined in our October 17, 1922, price circular will apply.
>
> Prices for "Off Quality" glass, known to the trade as Steel Sash Grading, Greenhouse Special Grading, Fourth Quality and C Quality will be quoted by the Pittsburgh office upon receipt of specifications, and will not be guaranteed against any decline.
>
> Terms, 30 days net, 1% cash discount if paid within 10 days from date of invoice.

The action of the American Window Glass Company was followed by the announcements of other leading concerns that a cut in prices would be made. The Johnston Brokerage Company issued the following list:

> Effective this date, we quote on flat drawn glass manufactured by the Fourcault process, and also on cylinder machine made glass and hand made glass, carloads and larger quan-

tities, for shipments to points within the United States, the following discounts from the manufacturers' price list of October 16, 1912:

Single strength, A and B quality, 25" bracket sizes, 88%.

Single strength, A and B quality, 34" and 40" bracket sizes, 86%.

Single strength, A and B quality, 50" and above, 85%.

Double strength, A quality, all brackets, 87%.

Double strength, B quality, all brackets, 88%.

All plus boxing charge, first three bracket sizes, 50-foot boxes, 20c per box, sizes above third bracket up to and including 100 united inches, 50-foot boxes, 40c per box; sizes over 100 united inches, 100-foot cases, 80c per case.

F. o. b. factory making shipment, freight equalized with Pittsburgh, Columbus, Kansas or Shreveport.

Terms of payment: 30 days net, 1% cash discount if paid within ten days of invoice.

"There will be an extra charge for cutting all fractional sizes single strength, one fraction 15c per box; single strength, two fractions, 30c per box; double strength, one fraction, 20c per box; double strength, two fractions, 40c per box.

Orders and specifications subject to our approval, shipments to be mutually arranged.

The above prices are guaranteed against our own decline, up to December 1, 1924.

The Interstate Window Glass Company announced the adoption of the same prices and terms that the American Window Glass Company has put into effect.

The Libbey-Owens Sheet Glass Company also issued a notice dated August 18, as follows:

Effective from August 1st, 1924, we quote single and double strength flat drawn sheet glass at the following discounts from the list of October 15th, 1912:

Single Strength A Quality—
25" Bracket 87/5%
34" 40" Brackets 85/6%
50" Bracket and above.....84/2%

Single Strength B Quality—
25" Bracket 88/5%
34" 40" Brackets 86/6%
50" Bracket and above 85/2%

Double Strength A Quality—
All brackets .....86 %

Double Strength B Quality—
All brackets .....88 %

All of our A glass is paper packed. The usual boxing charges and fractional cutting charges specified in our circular of October 19th, 1922, will apply. The customary selling commission of three per cent. will be allowed on carload shipments on orders from the trade direct to their customers.

Continuing our policy announced in our circular of February 14th, 1922, all shipments of single and double strength glass will be invoiced at our discounts in effect at time of shipment. Terms: f. o. b. factory, one per cent, 10 days, 30 days net, from date of invoice.

Freight equalized with Kansas, Pittsburgh or Columbus, according to destination of shipment.

Flint Wage Scale Not Completed

The joint wage conference of the National Association of Manufacturers of Pressed and Blown Glassware and the American Flint Glass Workers' Union adjourned on July 29 without making any changes in wages in any of the departments for the coming year. In certain departments the manufacturers demanded a reduction in wages and the workers an increase, but it was agreed that if no understanding was reached prior to September 1, 1924, the present scale would be used until further developments.

Arrangements were made for meetings to discuss these matters at a later date and a joint conference was held on August 13 and 14 at the Pittsburgh headquarters of the manufacturers' association, at which time the wage scale for the pressed blank, off-hand blank and cooking ware departments were discussed. The manufacturers' demands for a reduction and the workers' stand for an increase prevented any agreement being reached, which means that on the expiration of the present scale, September 1, 1924, factories operating will continue to pay last year's scale.

Another meeting to discuss the punch tumbler and stem ware branches in which no agreement as yet has been reached will be held on September 3, at Pittsburgh.

Few Hand Plants Will Be Active

In a letter by Fred Vandegrift, president of the National Window Glass Workers, issued on August 18 to the officers and members, attention was called to the perplexing problems facing the hand factories. While in 1921 sixty-five hand factories operated, it is thought that no more than fifteen plants at the most will resume operations during the coming blast.

A tentative list of sixteen plants which may operate is given herewith, but this list is very uncertain and subject to change, especially since the reduction of approximately 13 per cent in the selling price of glass has been announced by the American Window Glass Company and other manufacturers. In view of this reduction, some of the manufacturers listed below say they will not operate their plants this year unless there is a substantial reduction in wages.

The manufacturers held a meeting in Wheeling, W. Va., on August 22, and arrangements have been made to hold a wage conference between the manufacturers and workers at Cleveland on September 3.

Mr. Vandegrift stated that the conference this year will be of very great importance to the future of the trades. Competition in the hand branch of the window glass industry has become so keen and the present situation is so acute that the question will be just how to legislate in order to prolong the hand industry.

	Pots
Alliance Window Glass Co., Salem, W. Va.	36
Citizens Glass Co., Barnesville, O.	36
Dunkirk Window Glass Co., So. Charleston, W. Va.	39
Harding Glass Co., Fort Smith, Ark.	60
Illinois Window Glass Co., Danville, Ill.	30
Independent Glass Co., Sistersville, W. Va.	24
Jeannette Window Glass Co., Point Marion, Pa.	30
Lafayette Window Glass Co., Clarksburg, W. Va.	36
Model Window Glass Co., Fort Smith, Ark.	24
Modern Window Glass Co., Salem, W. Va.	36
Mountain State Window Glass Co., Mannington, W. Va.	42
National Window Glass Co., Huntington, W. Va.	60
Patterson Glass Mfg. Co., Cameron, W. Va.	24
Penn Window Glass Co., Pennsboro, W. Va.	36
Premier Window Glass Co., Pennsboro, W. Va.	42
Salem Co-Operative Window Glass Co., Salem, W. Va.	24

One Hundred Years of British Glass Making

Chance Brothers & Company, Ltd., of Birmingham, England, one of the world's most widely known glass manufacturers, recently celebrated their completion of one hundred years of active and honorable service in the industry.

Founded in 1824, Robert Lucas Chance on May 18 of that year acquired the property of the British Crown Glass Company at Smethwick and thereby laid the foundation for the present great modern works at that place, which now has the proud record of a century of achievement to its credit, and which under the administration of George Ferguson Chance, its present chairman, who for more than twenty years has guided its course through peace and war, is still going forward in characteristic fashion.

Among its notable successes was the introduction into England of modern sheet glass, replacing crown glass, which up to 1832 was the only kind manufactured in England. For forty years, from the introduction of thin microscopic coverglasses in 1840, the Chance Brothers' factory was the only one in the world producing such glass, which revolutionized microscopic practice.

From 1848 to 1914, they were the only producers in the British Empire of optical glass. Only through their experience and facilities and at heavy financial loss to themselves was it possible to meet the needs of the British navy, army and air force for optical glass during the world war, when importations were completely stopped.

The firm's Lighthouse Works, established in 1851, introduced that industry into the United Kingdom, and through the enthusiasm and attainments of the late Sir James Timmins Chance, Dr. John Hopkinson, and others, revolutionary improvements were made in the design and operation of lighthouse equipment. Chance brothers have constructed and erected lighthouses for every maritime power in the world.

For seventy years the firm has been making polished plate glass in immense quantities and shipping it to all parts of the world. Colored sheet and signal glass is another branch of this extensive business. In spectacle glass the firm is one of the leading manufacturers of the world. It developed Chance's Crooke's glass, and a recent achievement (1923), is the production of a tinted rolled glass for roofing purposes, which, it is claimed, cuts off 60 per cent of the sun's heat while transmitting 60 per cent of the light.

The products of the firm are stamped with the word "Chance," which name "has been a household word in the glass trade since the days of King William IV."

Department of Glass Technology at Sheffield University Proposes New Maintenance Plan

A circular addressed to the glass manufacturers of Great Britain and to others interested in the trade, makes an appeal for funds with which to continue the research and educational work of the Department of Glass Technology, at Sheffield University.

An income from fresh sources of not less than £3,000 a year is required, and it is pointed out that the firms which have been benefitting heretofore from the work of the department, many of which up to the present have contributed nothing to its maintenance, must now come to its assistance or it will become necessary to curtail its activities to a large extent.

To obtain the necessary funds a plan has been proposed whereby glass manufacturers will be asked to pay an annual subscription, based on their individual tank and furnace deadweight capacity, and in addition, a royalty per ton on their output of glass.

The proposed basis for the assessments is detailed as follows:

TANK FURNACES

Total deadweight capacity.	
150 tons and over	£25 per annum.
100-150 tons	£20 " "
50-100 tons	£15 " "
50 tons and under	£10 " "

POT FURNACES

Total capacity of pots in all furnaces.	Fixed Subscription.
20 tons and over	£25 per annum.
15-20 tons	£20 " "
10-15 tons	£15 " "
10 tons and under	£10 " "

ROYALTY

The proposed royalty is as follows:

Common tank melted glass	2 pence per ton.
Soda lime glass made in pots	4 " " "
Crystal table ware glass, electric light bulbs, chemical and special glasses	6 " " "

In return for the support of the manufacturers the department will agree to have representatives make quarterly visits to subscribers' factories and advise and discuss problems of interest to them; to visit them when needed in times of emergency; to give short talks to the operating staffs of the factories when on periodic visits, explaining processes, etc.; to advise them by correspondence when called upon to do so; to occasionally make temperature measurements, efficiency tests on furnace, tank and gas producer operations and to make experimental tests for subscribers at the Department at cost price, the manufacturers to pay all traveling expenses incurred in making emergency visits and efficiency tests.

Plate Glass Production for Second Quarter

Figures showing the production of plate glass during the second quarter, ending June 30, 1924, were recently given out by P. A. Hughes, secretary of the Plate Glass Manufacturers' Association. For this quarter the total production was 21,777,789 square feet. Production during the first quarter ending March 31, was 22,005,629 square feet, which shows a decrease for the second quarter of 1924 of 277,840 square feet from the production of the first quarter.

The total production for the first six months of 1924 was 43,783,418 square feet, compared with 43,962,855 square feet made during the first half of 1923. The production, therefore, of the first half of 1923 exceeded that of the first half of 1924 by 179,437.

Bottle Blowers' Wages Unchanged

The executive board of the Glass Bottle Blowers' Association of the United States and Canada, and the bottle manufacturers finally, after discussion of the manufacturers' demand for a reduction of five cents an hour on the flat rate in the automatic machine department, agreed that the wage scale existing at present would be continued for another year beginning September 1. No changes in working regulations were made.

James Maloney, who has been vice-president of the association for the past eight years, was advanced to the office of president, in succession to the late John A. Voll, whose death, as announced in our August issue, occurred at Atlantic City, N. J., on July 27.

President Maloney has announced that acting under the power placed in his hands by the Union's constitution he has appointed W. W. Campbell, Rochester, N. Y., to be vice-president until the next annual convention. Mr. Campbell has been a member of the executive board since 1916.

Shock-Resisting Glass in Czechoslovakia

According to a report made by H. Lawrence Groves, Acting Commercial Attaché, Prague, the owners of the patent for the production of a shock-resisting glass under the trade name "Resista" (reference to which was made in *Commerce Reports* for June 11, 1923) have come to an agreement with the Prague Glass Works (Ltd.) looking to the production of "Resista" glass by the latter company as soon as the plant can make necessary technical preparations. Something over a year ago the patentee of this glass was instrumental in the organization of the Resista Glass Co., which undertook the production of this patented glass on a very small scale in Pilsen; this undertaking, however, did not succeed and the operation ceased after a few months.

The Prague Glass Works was organized in 1919 with a share capital of 12,000,000 crowns. It is engaged principally in the manufacture of laboratory glass and specialties of glass products, watch glasses, etc.

International Discussion of Glass Works Labor

At the Sixth Session of the International Labor Conference held at Geneva, Switzerland, during the latter part of June and early July, the question was discussed of a weekly suspension of work for twenty-four hours in glass manufacturing processes where continuous tanks are used. In the American glass industry the seven working-day week was long ago abolished, but it still prevails in Europe to a great extent throughout the industry.

The conference drafted a convention, the provisions of which call for the suspension of work for twenty-four consecutive hours per week, with certain exceptions in unusual cases. Representatives from various countries objected to the proposed change in methods, some of them stating that it is absolutely impossible to successfully put so radical a change into effect in their own countries.

Subsidy for Dutch Glass Industry

The Dutch Government has decided to aid the municipalities of Delft and Schiedam in granting subsidies to the glass industry of these two cities but only for the production which is destined for abroad. The subsidy will be calculated in proportion to the amount of fuel used in the manufacture of products for export.

Wage Reduction Reported

Local papers report that the Interstate Window Glass Company posted notices in their Mt. Jewett factory August 20, announcing a 10 per cent cut in all wages excepting those who are working on a fixed scale.

Prof. Silverman Presents Educational Plan

Professor Alexander Silverman, Head of the Department of Chemistry, University of Pittsburgh, presented a paper entitled "A New Method of Evaluating Students' Work" before the Section of Chemical Education at the 67th Meeting of the American Chemical Society, Washington, D. C., in April, 1924. The paper sets forth the author's plan for improving methods of education and suggests that if it were given a ten years' trial in an institution of learning it would unquestionably raise that institution to a level far higher than the average college or university of America holds at present. This interesting paper has been printed in *Industrial and Engineering Chemistry*, Vol. 16, No. 8, August, 1924, under the title "Selective Instruction."

On August 5 Prof. Silverman addressed the Rotary Club at East Liverpool, O., on the subject of "Glass."

The Milling of Garnet

Gravity separation of abrasive garnet from hornblende, minerals which are intimately associated in the New York deposits, presents difficulties owing to the small difference in the specific gravity. It is believed that a detailed study of milling methods would not only be of assistance to garnet producers, but the data obtained from such a study would be useful in its application to problems in the milling of other ores and minerals. Such a study will be undertaken by the Department of the Interior, the work being assigned to the New Brunswick, N. J., and Rolla, Mo., experiment stations of the Bureau of Mines. Garnet abrasives are employed in grinding plate glass and for other purposes.

The production of garnet in the United States in 1923, according to the Geological Survey, amounted to 9,006 short tons, valued at $688,437, an increase of 1,952 short tons over the 1922 production, which was 7,054 short tons valued at $566,879.

Investigating Lead Poisoning

The division of industrial hygiene of the New York State Department of Labor is at present conducting an intensive drive for the purpose of completing a study of lead poisoning. The cause, elimination and prevention of the hazard will be inquired into and physical examinations will be made of those exposed to the hazard.

All occupations wherein lead is reputed a hazard are given in Bulletin 306, U. S. Department of Labor, and include acid finishers (glass), art glass workers, bottle cap makers, cut glass workers, glass finishers, mixers, polishers, mirror silverers, and glass putty polishers. The Metropolitan District has been selected for the starting point of the investigation and the glassware and mirror trades are among those slated for early attention.

Belgian Glass Industry

The plate glass situation according to *Commerce Reports* has been improved to some extent by better demand from American automobile manufacturers, but the window glass branch is seriously handicapped by exchange fluctuations, and incoming orders in July absorbed only about 80 per cent of the current monthly production. Prices are declining and business is mainly confined to the Orient. Owing to a continuance of the present wage scales in collieries and metallurgical industries, glass manufacturers were obliged to cancel retroactively a 3½ per cent wage cut projected from July 1.

Russian Glass Industry

It is reported that at a conference of glass and pottery manufacturers held recently in Russia, the question of increasing production during the year 1924-1925 was discussed. Conditions are favorable for doing so, but it was finally decided to leave the matter open until the results of this summer's harvest are known. The importance of adopting more modern methods of production was emphasized, but at the same time the necessity of limiting expenditures was pointed out.

Sales of Glass and Other Sand

According to figures issued by the Department of Commerce, 2,034,958 short tons of glass sand valued at $3,751,778 was sold in the United States during the year 1923. This is an increase over 1922 of 266,309 short tons valued at $885,412. Grinding and polishing sand to the amount of 1,456,039 short tons and valued at $2,361,695 was sold, this being an increase over 1922 of 272,878 short tons valued at $629,226. Fire or furnace sand to the amount of 307,794 short tons valued at $445,479 was sold. This is an increase over 1922 of 70,729 short tons valued at $109,394.

Australian Arsenic

According to Consul Romeyn Wormuth, Newcastle, the arsenic mines operated by the state at Jibbenbar, Australia, produced during the past year about 300 tons. Stocks on hand January 1, 1923, amounted to 200 tons. A mine at Sundown produced 700 tons of arsenic. Another plant at Sundown produced 200 tons. New works were put into operation at Fassifern, New South Wales, for the production of white arsenic. At Wallangarra, a chemical works is in operation which treats 10 tons of ore per day and produces white arsenic averaging 99.8 per cent.

Management Week

Five national societies, headed by the American Society of Mechanical Engineers, will participate in Management Week, October 20-25, 1924, in seventy-five cities throughout the United States and Canada. The other four societies sponsoring these activities are the American Management Association, National Association of Cost Accountants, Society of Industrial Engineers and Taylor Society.

Many important subjects will be discussed by prominent speakers at the seventy-five meetings which will be held. Full particulars can be obtained from Ernest Hartford, secretary, 25-33 West 39th street, New York, N. Y.

Exposition of Inventions

An Exposition of Inventions will be held in the Engineering Societies' Building, New York City, December 8 to 13, inclusive, 1924. The leading feature will be exhibits from American industries showing developments of machines, utilities and processing methods. Arrangements for the display of working models or actual devices can be made through the Committee of the American Institute of the City of New York, 47 West 34th street, New York.

New Plate Glass Corporation

Various references have been made in the press during the past few weeks concerning the new Pennsylvania Plate Glass Company, which is being organized by W. A. James, formerly of the American Plate Glass Company. Announcement has been made of an offering of 40,000 shares of 8 per cent cumulative, fully paid and non-assessable preferred stock, par value $50, and 16,000 shares fully paid, non-assessable common stock, of no par value.

The new plant is to be located at James City, Elk County, Pa. This town was founded by W. A. and E. B. James, brothers, who were originally engaged in extensive lumber operations in that section. When the supply of lumber was exhausted the brothers decided to establish a plate glass factory with the result that the American Plate Glass Company was organized. The success of this concern, which was recently sold to the Durant automobile interests, is widely known. From the time the factory began operations on October 8, 1907, until today, the plant has never been closed down, with the exception of one period when it was practically wiped out by fire.

The demand for plate glass has continued to hold up so strongly that Mr. James became convinced that an additional source of supply is needed, hence he planned to organize the Pennsylvania Plate Glass Company. The prospectus of the

new concern states that the entire plant will be entirely electrically equipped and that power will be furnished by the Keystone Power Corporation. A yearly production capacity of 5,000,000 square feet of polished plate will be provided for. The proceeds from the sale of stock will be devoted to erecting and equipping the plant and providing capital for its operation.

Owens Bottle Semi-Annual Report

The statement of Owens Bottle Company and subsidiary companies for six months ended June 30, 1924, shows net profits of $2,033,659 after expenses and Federal taxes, equivalent after preferred dividends to $2.61 a share (par $25) earned on the $16,512,750 common stock. This compares with $2,238,303, or $2.90 a share, in first half of 1923. Consolidated income account for six months ended June 30, 1924, compares as follows:

	1924	1923	1922
Mfg. prof. & roy.....	$3,139,225	$3,231,740	$2,226,660
Other income	362,109	251,995	604,829
Total income	$3,501,334	$3,483,735	$2,331,489
Operating expenses	1,193,675	962,132	681,936
Net earnings	$2,307,659	$2,521,603	$2,149,553
Federal taxes	274,000	283,300	220,400
Net profit	$2,033,659	$2,238,303	$1,929,153

Prof. Turner Pittsburgh Honor Guest

The Pittsburgh Section of the American Ceramic Society will have the pleasure of entertaining Prof. W. E. S. Turner, the renowned British scientist and glass specialist, and Mrs. Turner, who are visiting this country, as honor guests at an informal dinner to be held at the University Club, Pittsburgh, on Thursday evening, September 4.

J. W. Cruikshank, 230 Fifth avenue, Pittsburgh, Pa., chairman of the Pittsburgh Section, is in charge of the arrangements. Tickets for the dinner, which will be held at 6:30 p. m., are $2.50 per plate. Glass manufacturers are invited and ladies will be welcome.

Trade Activities

The plant of the **Lafayette Window Glass Company,** Clarksburg, W. Va., will resume operation on September 2, giving employment to 250 workmen for 10 months.

The Dura Glass Manufacturing Company will soon begin glassmaking operations in the plant formerly occupied by the Athens Glass Company, Morgantown, W. Va.

The Western Wire Glass Company, Torrance, Cal., have temporarily given up the idea of installing Fourcault machines at their plant.

The Capstan Glass Company, Connellsville, Pa., are planning the erection of an additional furnace, together with all necessary lehrs, buildings and equipment, which it is expected will be ready for operation next spring.

The Scohy Sheet Glass Company, Sistersville, W. Va., recently organized, has placed an order for eight Fourcault sheet glass drawing machines, four of which are to be delivered promptly and the rest at a later date.

The glassware factory of the **J. E. Marsden Glass Works, Inc.,** Ambler, Pa., was seriously damaged by fire on August 16. Involved in the destruction was the office, warehouse and packing department, mold and machine shop. Reconstruction has already begun.

The Eldred, Pa., *Eagle* reported on August 15 that a persistent rumor had been in circulation to the effect that local stockholders of the **Interstate Window Glass Corporation** were making efforts to purchase from that concern the local plant and again operate it as a private enterprise.

Turner Bros. Company, Terre Haute, Ind., have had a very successful run on their large flint tank. After twelve months it is still going strong. When it becomes necessary to close down for repairs they are arranging to add 8 feet to the melting end, put on two dog-houses and make other improvements.

Fire entirely destroyed the **Quertinmont Glass Company's** factory at Point Marion, Pa., on July 26th. The loss, estimated at $100,000, was covered by insurance. The plant formerly manufactured hand blown glass, but has not been in operation since 1923.

B. F. Drakenfeld & Company, Inc., manufacturers and dealers in glassmakers' chemicals, 50 Murray street, New York, N. Y., announce that they have been appointed sole sales agent to the glass industry for the American Smelting and Refining Company's dense white arsenic.

The General Electric Company have plans under way for extensions and improvements at their electric light bulb plant at Niles, O., which include the installation of a larger furnace unit for operating the glass blowing machines, as well as several new bulb machines and accessory equipment.

Conrad Weil, on July 29, was appointed receiver for the Buckeye Glass Company, Toledo, O., and was authorized to borrow $2,500 to take care of expenses while a plan is being worked out to place the concern on a stronger financial basis. The plant will not be operated while in the receiver's hands.

Fires have been started in the big tank at the plant of the **Puget Sound Glass Company,** Anacortes, Wash., and it is expected that before long the automatic blowing machines recently installed will be turning out bottles at the rate of twenty tons per day.

The Pennsylvania Glass Company, Conshohocken, Pa., recently organized, according to press reports has leased buildings formerly occupied by the Hummel Steel foundry, and will remodel the plant for the manufacture of glass tubing and sanitary glassware.

The Eldred Window Glass Company, Punxsutawney, Pa., are having some repairs made at their plant including the raising of the roof of the present building to allow for the installation of new machinery. The company expects to begin glassmaking operations about October 1, if conditions in the glass market continue favorable.

The Owens Bottle Company has appealed from the decision of the federal circuit court, at Toledo, O., against the dismissal on February 28, 1924, of their patent suit in the lower court against the **Libbey Glass Manufacturing Company.** The Owens Company desires to have the court order reversed and to carry the case to the Circuit Court of Appeals.

The Kane, Pa., plant of **Interstate Window Glass Company** began operation on August 26, after a shutdown since January. Extensive repairs have been made, and it is reported that the plant is in such condition that a run of two years could be made without cold repairs if business conditions permit.

Application has been made by J. F. Arbogast, Samuel Wallwork, Jr., Andrew C. Wallwork, Jesse E. Wallwork, George F. Wallwork and Jane C. Wallwork for Pennsylvania charter for an intended corporation to be called **Arbogast Glass Company,** Clarion, Pa., to manufacture, sell and deal in glass and equipment for manufacturing the same.

The plant of the **Brookville Glass & Tile Company,** Brookville, Pa., was sold at a trustee's sale on August 18 to F. C. Deemer of Brookville, who was the highest bidder. It is not known what Mr. Deemer's plans are in regard to the future of the plant.

The Amsler-Morton Company, Pittsburgh, Pa., has taken contracts for the erection of three 6 by 60 ft. lehrs for Swindell Brothers, Baltimore, Md.; one 3½ by 85 ft. continuous conveyor decorating lehr for the Pyrocolor Corporation, New York, and fuel oil systems for both concerns. Also a contract for an 8 by 65 ft. "C" type lehr for the Gleason-Tiebout Glass Company, Brooklyn, N. Y.

The proposed amalgamation of the **Cincinnati Plate Glass Company** with the **Standard Plate Glass Corporation,** of Pittsburgh, was ratified at a meeting of the stockholders of the Cincinnati firm on August 19. The latter company is to be operated under its present name for the time being as a division of the Pittsburgh company. The amalgamation is said to have been made on the basis of an equal transfer of stock.

The Bison Plate and Window Glass Corporation, of Buffalo, N. Y., which was also merged with the Standard Plate Glass Corporation recently, will be operated as a division of this corporation and will take care of the distriubtion of Standard products glass and paints in the same territories as heretofore covered.

The Standard Glass Manufacturing Company, Bremen, O., which started operations early in May now have about fifty people engaged in decorating, etching, polishing, marking and cleaning plain and fancy tableware, etc. The company expects to erect three new buildings in the near future: one, 80 x 90 ft., one, 40 x 35 ft., and the third, 30 x 35 ft. The men in charge are: Louis Fritz, general manager; Bert Norman, superintendent, and Justin Jenkinson, assistant superintendent.

W. B. Speer, who for the past year was in charge of the general mold shop of the United States Glass Company, Pittsburgh, Pa., has severed his connection with that concern and will devote his time to selling glasshouse supplies, specializing in asbestos cord and woven tubing, polishing stones for mold makers, carborundum, gauge wood for mold shops, mold studs and other mold shop supplies. Mr. Speer's address is P. O. Box 818, Pittsburgh, Pa.

The Pacific Window Glass Company, Los Angeles, Cal., organized a few months ago, has purchased the plant of the Patterson Glass Co., and will take possession immediately. The works have been devoted to the manufacture of window glass, and the new owner will make a number of extensions and betterments and begin operations at an early date. It is proposed to provide additional equipment later. E. P. Jones is president of the purchasing company; S. E. Pierce is treasurer; and Charles Martin works manager.

The Glass Outlook, monthly house organ of the **United States Glass Company,** Pittsburgh, Pa., calls attention to the fact that according to the *New York American* there is no such thing as a serious summer slump; "During July and August street car travel is 99 per cent normal, telephone calls are 87½ per cent normal, factory employment is 98½ per cent normal, factory payrolls are 98 per cent normal, wholesale drygoods are 97 per cent normal, wholesale hardware is 95½ per cent normal, building contracts are 99 per cent normal. These are the facts. They can be proved against any 'they say' statements on the summer business situation."

H. P. Sinclaire & Company, Corning, N. Y., manufacturers of cut glass, according to an announcement of the Chamber of Commerce, Dunkirk, N. Y., have purchased a plant on Lamphere street, in Dunkirk, which, after being remodeled will be used for the manufacture of glassware. Mr. Sinclaire has been associated with the glass business all his life and his father and Amory Houghton, father of Alanson B. Houghton, present ambassador to Germany, were associated in the forming of the Corning Glass Works. Later on H. P. Sinclaire established his cut glass factory in Corning, N. Y.

The plant of the North Wheeling Glass Bottle Company, Wheeling, W. Va., was sold for $80,000, on August 6, to the **Wheeling Glass Manufacturing Company,** also of Wheeling, on an order approved by Judge J. B. Somerville, of the circuit court. Repairs have been made to the plant and new machinery installed. A line of decorated and undecorated shades, and cut and uncut talbewares will be manufactured. Operations will begin about October 1. The officers of the new company are: F. H. Lange, president; Seaton Alexander, vice-president; Robert G. Pease, secretary-treasurer; and directors: F. H. Lange, J. Adam Blum, Albert L. Wilkie, Seaton Alexander, Robert G. Pease, T. J. Straight, Edward S. Kuglen and T. E. I. O'Donnell.

The Standard American Glass Company has, to date, spent over $100,000 on their new window glass factory which is being erected at Santa Ana., Cal. The first unit on their 10 acre tract, when completed and equipped, will have cost in excess of $300,000. The second unit, to be built on a newly acquired 15 acre tract, will double the company's investment in buildings and equipment. The local glass plant has already received 200 tons of broken glass, and a carload of 40 tons more is scheduled to arrive daily until 1,200 tons have been received. It will require this amount to mix with the batch in the melting tanks when operations begin.

Already the box factory and material house, both built of corrugated iron, are completed. Construction is now under way on the 141 ft. chimney for the glass tank.

Business Publications

The Concrete Dope Book. A little booklet compiled and published by W. H. Stewart, of the Stewart Manufacturing Company, 151 Rath street, Waterloo, Ia., makers of concrete mixers. Because it gives it considerable information regarding concrete, such as tables showing materials required for a given quantity of concrete for sidewalks, footings, foundations, walls, concrete blocks, etc., with estimates of costs, this booklet should prove decidedly useful to the factory man who occasionally or frequently has building jobs and repairs to do around his plant.

Potentiometer Pyrometers. Leeds & Northrup Company, manufacturers of electrical measuring instruments, 4901 Stenton avenue, Philadelphia, Pa. Catalog No. 87. 52 pages.

This catalog gives numerous facts about pyrometers, discusses the selection of pyrometer equipment and indicating, recording and controlling instruments. Price lists of all of these instruments and accessories such as switches, bus-board bars, signal lamps, charts and inks are given. The last two pages are devoted to the theory of the potentiometer pyrometer.

Boric Oxide as a Constituent of Glass, by H. Goulding-Brown. Published by the Pacific Coast Borax Company. Size 8½ x 5½ inches, 47 pages. Printed by Blades, East & Blades, Ltd., London.

This booklet is a compilation of a number of recent papers, containing information concerning the use of boric oxide in glass. Much of the work done by the United States Bureau of Standards and by the Department of Glass Technology of the University of Sheffield has been incorporated in this publication. It should be of unusual interest to all glass makers, whether they are already using boric oxide or not. It appears probable that boric oxide could be used advantageously in many kinds of glass which are now being made without this ingredient.

The introduction is written by the eminent British scientist, Professor W. E. S. Turner.

General Refractories Company, 117 South 16th street, Philadelphia, Pa. A 94-page catalog of the company's products, which include fire clay, silica, magnesite and chrome brick, silica cement, ground fire clay, high alumina super-refractories, dead-burned magnesite, magnesite cement, lump or ground chrome ore, chrome cement and ground ganister. Many views are shown of the company's various plants, two of which are located in Pennsylvania, two in Kentucky, two in Illinois and one in Maryland. Five clay mines are operated in Pennsylvania, three in Kentucky and one in Missouri. Two ganister mines are operated in Pennsylvania and three in Wisconsin.

The catalog lists the standardized silica and clay fire brick sizes, gives particulars of other products and contains a large amount of useful data, tables and general information.

Trade Standards Adopted by The Compressed Air Society, New York, 1923. This 40-page pamphlet embodies the result of extended study and research on the part of the executives and engineers associated with the members of The Compressed Air Society and embraces the nomenclature and terminology relating to air compressors and their operation; a history of the development of speeds of air compressors; an explanation of capacities and pressures; instructions for the installation and care of air compressors with illustrations of devices suggested for cleaning the intake air; recommendations for the lubrication of air compressing machines and the cleaning of air receiver piping; a description of the low pressure nozzle test recommended by the Society, and a partial list of applications of compressed air.

The Compressed Air Society publishes this pamphlet with the belief that there is a need for such an authoritative work of reference and that compressed air engineers and users as well as manufacturers of air compressors will appreciate this step toward the establishment of definite trade standards in the industry.

Crain's Market Data Book and Directory of Class, Trade and Technical Publications. 1924 edition. Size 6 by 9 inches. 505 pages. Price $5.00. Published by C. D. Crain, Jr., Chicago, Ill. This book contains a directory of class, trade and technical publications published in the United States and classified according to the industries they serve. Facts and figures on production and consumption in these industries are given, and in many cases buying habits and seasons are described. Valuable suggestions for manufacturers and dealers as to the kinds and quantities of equipment and supplies used in various industries are included. The whole is conveniently indexed and readily accessible for reference purposes. This book will give the advertiser whose product is suitable for use in various industries a considerable amount of information concerning the various fields and their buying power, as well as data relating to the selection of advertising mediums.

Personal Items

Bert W. Miller was elected president of the Window Glass Cutters' and Flatteners' Protective Association of America, as the result of the third ballot cast at all locals on July 12.

R. P. Brown, president of the Brown Instrument Company, Philadelphia, Pa., manufacturers of pyrometers and indicating and recording instruments, announces the appointment of **R. D. Bean** as the company's chief engineer.

W. L. Lamparter has been appointed factory manager for the Imperial Glass Company, Bellaire, O. Mr. Lamparter was formerly connected with Bartlett-Collins Glass Company, Sapulpa, Okla., in the same capacity.

Ray S. Godard, who recently resigned as construction engineer for the Illinois Glass Company, Alton, Ill., has accepted a responsible position with the Consumers' Glass Company, Ltd., Montreal, Canada, effective September 1. Mr. Godard and his family left Alton on August 20 and will make their future home in Montreal.

Edwin P. Arthur is now acting as consultant to the Pittsburgh Sheet Glass Company, Washington, Pa., as well as to the United States Window Glass Company, Morgantown, W. Va.

George W. Aiken, who returned to this country recently from Australia, where he had been connected with the Australian Glass Manufacturing Company, sailed on August 7 from New York, accompanied by his wife and mother, for Lima, Peru, where he will take charge of the completion and operation of the glass factory in which the Vulcan Iron Works of that city is interested.

Everett Greer, of the Hazel-Atlas Glass Company, of Washington, Pennsylvania, has been called to succeed C. O. Stewart as manager of the No. 2 Plant, of the Kearns-Gorsuch Bottle Company. Mr. Greer is well known in glass circles and has had many years' experience in the service of the Hazel-Atlas Glass Company. He will take up his new duties in the near future. C. O. Stewart goes to a responsible position with the Fraunfelter China Company.

Coming Meetings

The **Exposition of Inventions** will be held in the Engineering Societies Building, New York City, December 8 to 13.

The annual meeting of the **National Glass Distributors' Association** will be held in Pittsburgh, Pa., during December, 1924.

The **American Ceramic Society** annual meeting will be held at Columbus, O., February 16 to 21, inclusive, 1925. Summer meeting, Los Angeles, Cal., October 6 and 7, 1924.

The National Glass Distributors' Association, Western Division, will hold its next meeting in Chicago, Ill., September 9 and 10. The Eastern Division will hold its next meeting at Atlantic City, N. J., September 16, 17 and 18, at the Hotel Traymore. A meeting and dinner of the executive committee will be held on September 16, and a general meeting and luncheon will be held on September 17, with a dinner and dance in the evening. On September 18 a golf tournament will be open to all members.

National Ornamental Glass Manufacturers' Association will hold its next annual convention in Pittsburgh, June 24 to 26, 1925.

The **Third National Exposition of Power and Mechanical Engineering** will be held at the Grand Central Palace, New York, December 1 to 6, 1924. The exposition will as usual parallel the meeting of the American Society of Mechanical Engineers, which will be held in the Engineering Societies building, 29 West 39th street, New York.

Inquiries Received

For further information address THE GLASS INDUSTRY.

218. We are in the market for machinery and for full information regarding the cutting of glass circles ranging in diameter from 1½ in. to 12 in. from glass sheets of window glass quality. Also for machinery and full information regarding the operation, production and machines required for cutting, grinding, beveling and polishing glass circles made from either $\frac{1}{16}$ in. window glass or from $\frac{1}{4}$ in. plate glass, in diameters ranging from 2½ to 4 inches. (Aug. 22.)

219. Kindly give me the names of manufacturers of pint size glass jars and also private mold bottles. (Aug. 7.)

220. Will you kindly advise us for what purposes ground glass and powdered glass can be used? (Aug. 13.)

221. Kindly give us the names of domestic and foreign manufacturers of glass machinery, particularly the type used for beveling and edge work and surface polishing of glass. (Aug. 2.)

What the World Wants

Specific inquiries for American goods received in the Department of Commerce.

Numbers prefixed to the items refer to confidential information which may be obtained by concerns listed in the Exporters' Index by applying to the nearest district office of the Bureau of Foreign and Domestic Commerce, or to headquarters at Washington, D. C. Mention the number of the inquiry in which you are interested.

To become listed on the Exporters' Index, it is necessary to fill out a form (Form 57), which may be had upon application to the Bureau or its district or co-operative offices.

Scotland. 11,228, Needle etching machines for work on table glassware.
China. 11,271, Window glass, 16-ounce.
Australia. 11,301, cut glass; 11,303, pressed glassware.
Venezuela. 11,488, glass and porcelain jars for drugs and chemicals.
China. 11,481, glass tumblers.

Stock Quotations

(Reported by Moore, Leonard & Lynch, Union Trust Bldg., Pittsburgh, Pa.)

PITTSBURGH STOCK EXCHANGE, AUGUST 22, 1924.

	Bid	*Ask*	*Last*
American Window Glass Machine, common	85	90	90
American Window Glass Machine, preferred	.	94	94
American Window Glass, preferred	109	110	110
Pittsburgh Plate Glass	235	..	249
U. S. Glass	18	23	20
Standard Plate Glass, common	29	32½	29½
Standard Plate Glass, preferred			
cumulative	88	91	88
prior	98	101	100

The Pittsburgh market for the glass stocks was active and firmer during the last month. Advances were made in a number of issues. The effect of lower prices has not been noticeable as yet. Warehouse stocks of glass were reduced in July and jobbers are not overstocked so that an increased demand should bring a stimulation of production. The value of building contracts awarded in the 36 Eastern States for July was $344,700,000, compared with $387,500,000 in June and $315,000,000 in July 1923. The current declining tendency is expected to go still further in building, but the labor factor which is 75% of the total gives no appreciable indication of a reduction in wages. So long as this is true the chance of a much further reduction in building costs is small.

WHEELING STOCK EXCHANGE AUGUST 22, 1924.

Hazel-Atlas	27	27½	27
Imperial	75	90	90
Fostoria	140	150	150
Central	105	108	108

The attention of the glass trade in Wheeling has been directed to the Hazel-Atlas plant where an artificial gas producer has been installed. Experiments so far have been very successful and it is hoped this installation will overcome the handicap of low gas pressure met by glass manufacturers in the winter. Glass stocks ruled moderately higher.

TOLEDO STOCK EXCHANGE AUGUST 22, 1924.

Owens Bottle Machine, common	43	44	43½
Libbey-Owens Sheet Glass, common	102	104	104
Libbey-Owens Sheet Glass, preferred	108	..	..

Current Prices of Glass-Making Materials

Quotations furnished by various producers, manufacturers and dealers

August 22, 1924

		Carlots	Less Carlots
Aluminum hydrate ($Al(OH)_3$)	lb.	.05	.05½
Aluminum oxide (Al_2O_3)	lb.	.06½	.07
Antimony oxide (Sb_2O_3)	lb.	.08½	.09
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.07½	.08
Barium carbonate ($BaCO_3$) (precipitated)	ton	63.00	70.00
Barium hydrate ($Ba(OH)_2$)	lb.	.05	.05½
Bone ash	lb.	.06½	.07½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	.05	.05½
Borax, fused ($Na_2B_4O_7$) any mesh	lb.	.19	.20
Boric acid (B_2O_3), fused	lb.	.35	.35
Cadmium Sulphide (CdS)—			
Red	lb.	..	1.60
Orange	lb.	1.50	1.65
Yellow	lb.	..	1.80
Chrome Oxide (Cr_2O_3)	lb.	.35	.36
Cobalt Oxide (Co_2O_3)—			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide—			
Red (Cu_2O)	lb.	..	.19
Black (CuO)	lb.	..	.25
Black prepared	lb.	..	.30
Cryolite (Na_3AlF_6)	lb.	..	.09½
Feldspar—			
100 mesh	ton	14.00-21.00	16.00-25.00
80 mesh	ton	15.00	18.00
40 mesh	ton	12.50	15.50
Ferrous oxide (FeO)	lb.	..	..
Fluorspar (CaF_2)—			
Powdered white, 95%	ton	35.00	..
Hydrofluoric acid (HF) 60% (in lead carboys)	lb.	..	.13
Kaolin (f.o.b. mine)	ton	9.00	12.00
Lead Oxide (Pb_3O_4) (red lead)	lb.	.11	.11¼
Litharge (PbO)	lb.	.10½	.10¾
Lime—			
Hydrated ($Ca(OH)_2$) (in 50 lb. paper sacks)	ton	12.50	..
Burnt (CaO) ground, in bulk	ton	9.00	..
Burnt, ground, in paper sacks	ton	11.00	..
Burnt, ground, in 280 lb. bbls. per bbl.		2.15	2.30
Magnesium carbonate ($MgCO_3$)	lb.	..	.08
Manganese 85% (MnO_2)	lb.	.03½	.03¾
Nickel oxide (Ni_2O_3), black, for nickel content	lb.	.32	.45
Nickel monoxide (NiO), green, for nickel content	lb.	.30	.50
Potassium carbonate—			
Calcined (K_2CO_3) 96%	lb.	.05½	.06
Hydrated (KOH) 85%	lb.	.06	.06¼
Potassium nitrate (KNO_3) (gran.)	lb.	.06	.06¼
Potassium Permanganate ($KMnO_4$)	lb.	.13¾	.14¼
Powdered blue	lb.	..	.24-.26
Standard formula	lb.	..	.32
Salt cake, glassmakers (Na_2SO_4), f.o.b. works	ton	25.00	30.00
Selenium (Se)	lb.	..	2.20-2.25
Soda ash (Na_2CO_3) dense, 58%— f. o. b. works.			
Bulk, spot — Flat	100 lb.	1.40	..
Bulk, on contract — Flat	100 lb.	1.35	..
In 400 lb. bbls., on contract	100 lb.	1.69	2.40
In 400 lb. bags, on contract	100 lb.	1.45	2.16
Spot orders .05 per 100 lbs. higher.			
Sodium nitrate ($NaNO_3$), refined (Gran.) in bbls	lb.	.04¼	.04½
Sodium selenite (Na_2SeO_3)	lb.	..	2.00
Sodium Fluosilicate (Na_2SiF_6)	lb.	..	.07½
Sulphur (S)—			
Flowers, 155 lb. bbl.	Per 100 lb.	3.35	3.65-3.90
Flowers, in bags	Per 100 lb.	3.00	3.30-3.55
Flour, heavy, in bbls.	Per 100 lb.	2.50	2.80-3.05
Uranium oxide (UO_3), 100 lb lots	lb.	..	1.35
Zinc oxide (ZnO)	lb.	.08	.08¼

Monthly Summary of United States Foreign Commerce in Glass

Exports

Corrected to July 24, 1924

	June 1923 Quantity	June 1923 Value	June 1924 Quantity	June 1924 Value	Twelve Months Ending April 1923 Quantity	Twelve Months Ending April 1923 Value	Twelve Months Ending April 1924 Quantity	Twelve Months Ending April 1924 Value
Glass and glass products (total)	.....	1,102,124	.....	775,535	.....	9,903,072	.....	9,839,946
Plate and window glass—								
Window glass, common, box 50 sq. ft	6,537	32,729	1,111	8,424	39,217	218,192	47,785	215,997
Plate glass, unsilvered, sq. ft	210,235	96,865	224,797	50,353	2,269,796	907,618	1,736,251	614,456
Other windows and plate glass, n.e.s. lbs.	339,955	44,302	131,916	17,607	3,207,249	350,391	2,234,325	254,201
Glass containers (bottles, vials and jars) lbs.	8,672,106	395,920	5,005,478	277,699	62,665,959	3,108,173	64,101,282	3,152,049
Table glassware, plain lbs.	1,837,443	198,782	1,426,005	173,820	18,644,936	1,965,746	18,246,026	2,065,648
Table and other glassware, cut or engraved lbs.	44,401	19,921	44,778	13,925	586,964	227,401	527,861	172,916
Glass for lighting—								
Lamp chimneys and lantern globes lbs.	210,812	43,048	157,054	29,345	1,678,246	329,184	1,999,454	377,877
Globes and shades for lighting fixtures lbs.	125,610	38,332	74,361	21,340	1,524,974	440,087	1,592,809	456,717
Lamps and other illuminating devices, chiefly of glass lbs.	154,363	34,871	99,926	28,442	1,296,158	368,414	1,373,005	355,292
Chemical glassware lbs.	15,126	14,338	16,041	15,226	206,356	145,988	247,146	181,711
Electrical glassware, except for lighting lbs.	123,777	12,087	434,959	32,678	2,954,321	191,779	2,794,471	228,365
Other glassware, n.e.s. lbs.	912,717	170,929	544,754	106,676	9,597,285	1,650,099	10,786,074	1,764,717

Imports

Corrected to July 24, 1924

		June 1923 Quantity	June 1923 Value	June 1924 Quantity	June 1924 Value	Twelve Months Ending April 1923 Quantity	Twelve Months Ending April 1923 Value	Twelve Months Ending April 1924 Quantity	Twelve Months Ending April 1924 Value
Glass (total)		.....	1,914,682	.....	2,036,268	.....	19,000,849	.....	24,483,986
Cylinder, crown and sheet lbs.—									
Unpolished, lbs.	dut.	3,497,773	169,956	4,171,398	240,056	49,683,240	2,194,953	36,313,747	1,918,707
Bent, ground, leveled, colored, painted, etc., and polished	dut.	.....	81,531	.....	34,587	.....	[2]586,502	.....	690,422
Plate glass—									
Unsilvered, sq. ft.	dut.	1,804,165	1,088,528	1,785,007	1,112,592	18,976,997	10,148,548	24,809,592	15,864,185
Fluted, rolled, etc., or silvered, or containing wire netting, sq. ft.	dut.	186,881	35,300	378,517	51,580	[2]1,572,606	[2]286,751	2,624,697	376,992
Containers—bottles, vials, etc.	dut.	.....	5,167	.....	13,351	.....	299,127	.....	189,686
Table and kitchen utensils, lbs.	dut.	16,673	6,181	196,263	45,681	[2]534,862	[2]192,940	943,745	206,096
Glassware, cut or decorated, lbs.	dut.	260,419	111,116	336,312	162,668	.....	1,622,969	3,738,596	1,670,900
Blown glassware, n. e. s., lbs.	dut.	512,556	103,878	.....	.....	[2]4,332,531	[2]948,214	[3]3,402,894	[3]881,319
Bottles, ornaments, etc., lbs.	dut.	.....	.....	671,615	205,372	.....	.....	[4]1,834,020	[4]618,539
Bulbs or electric lamps, number	dut.	.....	.....	538,470	11,159	.....	.....	[4]3,627,107	[4]73,814
Chimneys, globes, shades, etc., lbs.	dut.	.....	.....	380,483	62,081	.....	.....	[4]2,275,185	[4]370,209
Articles and utensils for chemical, scientific, and experimental purposes, lbs.	dut.	.....	.....	81,020	22,449	.....	.....	[4]473,185	[4]157,509
Other glassware	free	.....	.....	.....	.....	[1]44,483	[1]44,253	.....	.....
	dut.	.....	313,025	.....	74,692	.....	2,676,592	.....	1,465,608

[1] July to Sept. 21, 1922. [2] Beginning Sept. 22, 1922. [3] July 1 to Dec. 31, 1923. [4] Beginning Jan. 1, 1924.